
Niveau(x) d'enseignement: 0 Numéro EDUQ : 8670117
Centre d'intérêt: 640

Rapport collectif sur les A.P.O. en Californie / par Ginette Dion, Danielle Grenier, Jacques Malouin, Serge Malouin, Rodrigue Otis, Jacques Tardif, Rolland Viau. -- [Québec (Province) : s. n.], 1984.
74, [166] p. : ill., graph. : 28 cm.

Vedette(s)-secondaire(s): Dion, Ginette * Grenier, Danielle * Malouin, Jacques * Malouin, Serge * Otis, Rodrigue, 1940- * Tardif, Jacques * Viau, Rolland

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Descripteur(s): Application pédagogique de l'ordinateur * Enseignement assisté par ordinateur * Service de l'informatique * Didacticiel

Identificateur(s) de nom: Université du Québec à Hull * Californie * Etats-Unis

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Le rapport a été réalisé par un groupe de participants au voyage d'étude sur les APO en Californie organisé par l'Université du Québec à Hull. Les participants ont assisté à 19 rencontres, qui ont eu lieu dans la région de la Silicone Valley. Chaque rencontre, qui portait sur une application pédagogique de l'ordinateur, fait l'objet d'un compte rendu auquel est jointe, en annexe, la documentation qui fut distribuée lors de la rencontre. Le rapport se compose de quatre modules regroupant les présentations sous des thèmes globaux.

Type de document: r

EDUQ 8670117

RAPPORT COLLECTIF SUR LES A.P.O. EN CALIFORNIE

PAR Ginette Dion, Danielle Grenier, Jacques Malouin, Serge Malouin, Rodrigue Otis, Jacques Tardif et Rolland Viau.

AVRIL 1984

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RAPPORT COLLECTIF

SUR

LES A.P.O. EN CALIFORNIE

PAR

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Danielle GRENIER
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AVRIL 1984

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INTRODUCTION

Le rapport qui suit a été réalisé par un groupe de participants au voyage d'étude sur les A.P.C. en Californie, organisé par l'Université du Québec à Hull. La constitution du groupe s'est faite au hasard. En effet, lors du premier souper en terre californienne, nous avons constaté que chaque personne réunie autour de la table, désirait rendre accessibles au collègues de travail demeurés au Québec, les informations recueillies tout au long du voyage. C'est alors que l'idée nous est venue de réunir nos efforts et de rédiger un rapport collectif. Pour ce faire, nous avons convenu d'une réunion à la fin de chaque journée de rencontre afin de partager, confronter, discuter et rassembler les notes prises par chaque membre du groupe. Nous avons réussi à respecter (quasi scrupuleusement) les consignes de travail que nous nous étions données. Le rapport qui suit est le reflet de nos discussions.

LA STRUCTURE DU RAPPORT ET SES MODES D'UTILISATION

Comme nous avons dit précédemment, le thème général du voyage a été les A.P.O. pris dans son sens le plus large. Un éventail d'A.P.O. nous a été présenté à travers 19 rencontres, ayant lieu principalement dans la région communément appelée Silicone Valley. Chaque rencontre fait l'objet, dans ce rapport, d'un compte rendu et, pour la plupart d'entre eux, un ou des annexe(s) présente(nt) la documentation distribuée.

Etant donné les distances entre les lieux de rencontre, il a été impossible, pour les organisateurs du voyage, de planifier l'horaire à partir des contenus des présentations. Pour la rédaction du rapport, c'était plus facile. Nous avons donc décidé de regrouper les rencontres selon une structure non pas chronologique mais thématique. Les lignes qui suivent donnent un aperçu de cette structure et d'un même souffle, brosse un tableau général du rapport. Le rapport se compose de quatre modules regroupant les présentations sous des thèmes globaux.

MODULE 1: L'éducation en Californie

Ce module comporte trois présentations qui ont eu lieu au Département d'Education de la Californie à Sacramento. Nous avons décidé de mettre ce module en premier, car il se dégage de ces présentations l'approche dans laquelle s'organise et se pratique la pédagogie en Californie. Cette approche qui est sous le signe de la décentralisation et du support plutôt que sous la centralisation des décisions et des grandes politiques globales, influence grandement les types d'implantation d'A.P.O. en Californie. Nous avons donc jugé important, dès les premières pages, de vous donner l'atmosphère politique et gouvernementale dans laquelle les implantations des A.P.O. en Californie se réalisent.

MODULE 2: Des implantations et des réalisations

Dans ce module, cinq présentations rendent compte de trois niveaux d'implantation: l'une dans une école primaire, l'autre dans une école secondaire et l'autre au niveau collégial. Plusieurs caractéristiques ressortent de ces réalisations, les principales étant l'implication et la pression des parents dans le dossier A.P.C., la longévité des projets et l'originalité de certaines A.P.O. De quoi donner des idées.

MODULE 3: Les services disponibles

Nous avons regroupé, dans ce module, les sept présentations décrivant les organismes publics et privés offrant des services aux éducateurs oeuvrant dans les A.P.O. Le trait principal qui ressort de ces présentations est la diversité de l'aide offerte. Un autre trait, peu rencontré au Québec et qui se dégage bien en Californie, est la relation étroite entre l'entreprise privée et les services publics. Il semble y avoir peu de scrupule de la part des éducateurs pour se faire subventionner des laboratoires d'A.P.O. Il en résulte que les problèmes de "machine" n'ont pas ou ont peu été soulevés dans les rencontres. De quoi faire rêver nos collègues québécois.

MODULE 4: Le perfectionnement et la recherche

Ce module comprend trois présentations faites dans les universités et une réalisée au Pacific Studies Center, centre de recherche se préoccupant des impacts socio-économiques de la technologie informatique. Encore ici, la diversité dans laquelle se développe les programmes de perfectionnement et les objets de recherche est remarquable. Le mot d'ordre dans les A.P.O. en Californie semble se résumer à: Respectons et supportons toutes approches ou tendances, l'avenir fera son travail naturel de sélection.

Voilà donc brièvement la structure et les thèmes proposés. Le but que nous désirons atteindre par cette structure consiste à rendre possible plusieurs types de lecture. Ainsi, selon les intérêts et les besoins du lecteur, il peut:

- lire le rapport de la première page jusqu'à la dernière;
- ne lire que les comptes rendus pour avoir une bonne idée de l'ensemble des rencontres;
- lire tous les comptes rendus et approfondir les thèmes qui l'intéressent en lisant les annexes correspondantes;
- sélectionner un thème et l'approfondir;
- etc.

Nous proposons donc un rapport qui n'impose pas un type de lecture. Au lecteur de choisir.

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Jacques Malouin, U. de Sherbrooke

Serge Malouin, C. de Sherbrooke

Rodrigue Otis, U. de Sherbrooke

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MODULE 1

L'EDUCATION EN CALIFORNIE

1.1 LE DEPARTEMENT DE L'EDUCATION DE LA CALIFORNIE . ROLE ET ORGANISATION

David W. Gordon, Associate Superintendant Division

Département de l'éducation, Sacramento, California

PRESENTATION

Rôle:

Le département d'éducation de la Californie a un rôle de support et surtout un rôle administratif sur ses "districts" (équivaut à nos régions administratives). Leur philosophie se traduit comme une assistance et une aide à partir de guides qui doivent rendre l'enseignement meilleur. On veut, par ces productions, intégrer l'étudiant à un programme normal d'étude en fournissant à l'enseignant des manuels et des structures. Les différentes tâches de cette division se résument à:

. des services techniques
. des services de consultants
. des services de formation des enseignants (peu important)
. un leadership d'état.

Le département rencontré se préoccupe des besoins du primaire et du secondaire et n'a de liens que très peu soutenus et officiels avec le niveau universitaire. De plus, le système éducationnel est décentralisé. Le local, c'est-à-dire les "districts", détermine leurs orientations et leurs priorités. Cependant, en même temps que l'on vit cette situation de décentralisation, le département d'éducation cherche à centraliser et à se redonner un pouvoir semble-t-il difficile à retrouver. On retourne aussi aux valeurs traditionnelles en réintroduisant les cours d'histoire et de littérature. On implique aussi plusieurs organismes dans l'éducation, les universités, les parents et les différentes associations. On veut aussi demander plus de rendement aux étudiants et on désire aussi augmenter les règles de classification des enseignants. De plus, le système d'éducation est tellement large que l'on essaie de donner des services et d'assister de plus en plus les "districts" et ainsi de supporter le travail des professeurs parce que:

. les salaires des enseignants sont très bas
. l'ambiance de travail dans les écoles n'est pas vraiment excitante; ce serait même un endroit peu agréable.

Enfin, le département de l'éducation a ouvert la formation à l'ordinateur à toutes les disciplines. Il pense aussi que cette intégration prendra de cinq à dix ans et que présentement les didacticiels et logiciels disponibles ne sont pas suffisamment nombreux.

Organisation:

Pour comprendre l'organisation du département d'éducation de la Californie, il faudra se référer aux documents de l'annexe I.

POINTS SAILLANTS

- Un rôle de support et un rôle administratif.
- On veut augmenter la discipline dans les institutions scolaires.
- La formation à l'ordinateur recommandée pour toutes les disciplines.
- Un grand besoin de centralisation des programmes scolaires.
- Une philosophie d'assistance et d'aide.
- Les actions et les réactions se font à court terme.

DOCUMENTATION A L'ANNEXE I

- California State Department of Education
- California State Department of Education - Opérations
- Division of Curriculum and Instruction.
- The Complete Profile of Education Reform.

1.2 LE DEPARTEMENT DE L'EDUCATION DE LA CALIFORNIE
. LA DECENTRALISATION ET L'IMPLANTATION DES ORDINATEURS

Laura A. Wagner, Director Office of Staff

Département de l'éducation, Sacramento, California

PRESENTATION

Lors de cette rencontre, on nous a présenté trois programmes:

- Le Teacher Education and Computer Center Program (T.E.C.C.)
- Le California Mentor Teacher Program
- Le State Bilingual Teacher Training Program

Le Teacher Education and Computer Center Program (Document I de l'annexe II)

Le T.E.C.C. fait ses débuts en 1982 (voir division du réseau en 15 régions - California TEC Centers - annexe II) et il doit fournir des services de formation aux personnels, aux professeurs et aux administrateurs dans les régions. Le T.E.C.C. fournit aussi les services de professionnels en mathématiques, en sciences, en technologie et dans quelques autres secteurs. Les T.E.C.C. sont situés de façon à représenter les zones d'assistance, de besoins aux écoles de la Californie. Cela résulte en un réseau géographiquement étendu sur tout le territoire. T.E.C.C. est gouverné par un conseil composé en majorité de professeurs. Les tâches du T.E.C.C. sont d'offrir

- des méthodes d'enseignement et de formation
- de l'assistance technique pour supporter l'école dans le développement de ses programmes
- de l'information et de la formation au niveau des applications pédagogiques de l'ordinateur

  a) utiliser l'ordinateur comme un auxiliaire d'enseignement;

b) les critères d'achat et d'utilisation de l'ordinateur et des logiciels et didacticiels;

c) l'évaluation du matériel informatique ou relié à l'informatique;

d) enseigner les méthodes d'intégration de l'utilisation de l'ordinateur dans les activités de la classe.

Pour supporter le T.E.C.C. dans ses activités de formation à l'ordinateur, le San Mateo County Software Library and Clearinghouse a été créé pour faire des démonstrations et de la formation et pour faire circuler et évaluer les logiciels. Le T.E.C.C. doit aussi établir des relations avec les collèges, les universités, les industries et le monde des affaires pour offrir des services et des ressources.

Le California Mentor Teacher Program (document 2, annexe II)

Il débute en juillet 1983 et veut encourager les enseignants qui ont des aptitudes à demeurer dans le système public d'enseignement et à augmenter la qualité de l'enseignement dans ce même système. Le nombre maximum de professeurs-ressources alloué est de 5% du nombre total des professeurs permanents. La sélection et le choix des professeurs-ressources sont faits par un comité local où sont représentés parents, professeurs, administrateurs, étudiants et certains autres représentants extérieurs.

Le professeur-ressource doit:

. avoir le statut de permanent
. avoir une bonne expérience dans l'enseignement
. avoir démontré de très bonnes habilités d'enseignement

Le professeur-ressource recevra 4 000$ de bourse en plus de son salaire et ne pourra dépasser trois ans, sans quoi, il devra être renommé.

Ainsi, le professeur-ressource travaillera à:

- fournir du perfectionnement aux personnels des écoles;
- recycler les enseignants;
- prendre la responsabilité des apprenants;
- guider des nouveaux professeurs;
- devenir un instructeur exemplaire;
- produire des programmes pédagogiques.

Le State Bilingual Teacher Training Programs (Document 3, annexe II)

Ce programme de formation a été développé pour les professeurs ayant besoin de formation bilingue dans trois secteurs suivants: la langue, la culture et la méthodologie. On estime que 5920 professeurs ayant des besoins de formation bilingue ont été perfectionnés dans l'un ou plus d'un de ces trois secteurs. Les critères de sélection des professeurs de ce programme sont:

- Le professeur travaille dans une classe bilingue avec des étudiants ayant une connaissance limitée de la langue anglaise.
- Le professeur doit présenter, avec sa demande, une preuve d'un agent contrôleur approuvé par la Commission.
- Le professeur est inscrit et participe à un programme conduisant à un certificat de compétence bilingue ou l'équivalent.
- Le professeur démontre les aptitudes et les engagements pour satisfaire aux exigences du certificat de compétence.

POINTS SAILLANTS ET QUESTIONNEMENT

- Le programme T.E.C.C. fait de la formation sur le terrain au même titre que PERFORMA pour le réseau collégial.
- On croit à la formule du formateur enseignant à des apprenants qui enseigneront par la suite à d'autres apprenants.

- On met beaucoup d'effort sur l'évaluation de l'efficacité du professeur.
- Le T.E.C.C. est divisé en fonction des zones d'assistances.
- Le T.E.C.C. répond aux besoins de tous les personnels.
- Y a-t-il une relation entre le programme Mentor et la paie au mérite?

DOCUMENTATION A L'ANNEXE II

Document 1:	Overview of the Teacher Education and Computer Center (T.E.C.C.) Program.
	California T.E.C. Centers, divisions par district.
	Planning for the Educational Use of Microcomputers.
Document 2:	California Mentor Teacher Program.
Document 3:	The State Bilingual Teacher Training Programs.

1.3 LE DEPARTEMENT DE L'EDUCATION DE LA CALIFORNIE
. SUPPORT A TRAVERS LA DOCUMENTATION

Donovan A. Merch, manager

Département de l'Education, Sacramento, California

PRESENTATION

Trois types de documents supports à l'éducation sont envoyés dans les écoles:

- des manuels scolaires (handbook)
- des modèles dans des secteurs particuliers (framebook)
- et les conditions requises de graduation (raising expectations)

Les documents sont faits par le milieu scolaire et sont supportés par le département d'éducation. Ils sont aussi demandés par les enseignants. De plus en plus ceux-ci désirent des manuels précis qui répondraient à leurs besoins. Cependant, les districts sont toutefois libres de les utiliser. Les parents ont ici aussi un rôle important dans la préparation de ces manuels scolaires.

POINTS SAILLANTS

- L'enseignant du primaire, du secondaire désire qu'on lui prépare des manuels qui répondent à ses besoins.
- Les parents sont consultés.

Documents pour consultation (pour consultation, contacter l'un des rédacteurs de ce rapport)

1. Reading Framework for California Public Schools, kindergarten through grade twelve, California State Department of Education.

2. Handbook for Planning an Effective Reading Program, California State Department of Education.

3. Science Education for the 1980s, California State Department of Education.

4. Handbook for Planning an Effective Mathematics Program, kindergarten through grade twelve, California State Department of Education.

5. Handbook for Planning an Effective Writing Program, kindergarten through grade twelve, California State Department of Education.

6. Science Framework, kindergarten and grades one through twelve, California State Department of Education.

7. Mathematics Framework and the 1980 Addendum for California Public Schools, kindergarten through grade twelve, California State Department of Education.

8. Raising Expectations, Model Graduation Requirements, California State Department of Education.

9. Selected Publications of the California State Department of Education, hist. of Publications.

MODULE 2

DES IMPLANTATIONS ET DES REALISATIONS

2.1 ENSEIGNEMENT PAR TUTEUR (TUTOR PROJECT)

Joan Targ, Jeff Leminsky

Jordan Middle School, Palo Alto

PRESENTATION

Ce programme d'enseignement par tuteur (tutor project) est en place depuis 1975 à cette école qui regroupe huit cents (800) élèves âgés d'environ dix (10) à quatorze (14) ans. Le milieu socio-économique est de moyen à supérieur; les parents sont très impliqués au niveau de l'école et surtout très motivés face à l'apprentissage de l'informatique par leurs enfants.

Le programme a été mis en place grâce à la collaboration de l'industrie privée, le milieu universitaire et certaines fondations. Le programme d'enseignement par les pairs (Peer-tutoring project ou le computer tutor project) consiste d'abord à transmettre des habiletés à des enfants qui eux dans un second temps les transmettront à d'autres enfants. Sur une base volontaire, les enseignants sont d'abord formés à l'Université Standford en session d'été d'une durée de cinq (5) semaines. Le programme pédagogique comprend l'apprentissage du langage BASIC, le traitement de textes, le chiffrier électronique (spread sheet) et certaines connaissances techniques de façon à pouvoir, le cas échéant, effectuer des réparations mineures. Le programme destiné aux professeurs à l'Université Standford comprend des éléments de réflexions et de discussions sur des thèmes tels que comment convaincre les administrateurs, comment atténuer l'anxiété des professeurs, etc.... Dans un second temps, les professeurs entraînés transmettent les habiletés acquises à un certain nombre d'enfants qui deviennent des tuteurs. L'entraînement des tuteurs dure environ six (6) à huit (8) semaines. Les tuteurs qui terminent l'entraînement reçoivent un certificat qui est accroché aux murs du laboratoire; cette reconnaissance de compétence est un élément très renforçant pour l'enfant. Ces tuteurs enseignent à d'autres enfants de l'école, à des adultes et des aînés qui fréquentent l'école les soirs et les fins de semaine ainsi qu'à des enseignants en session de formation durant la période estivale à l'Université de Standford.

L'enseignement à l'école auprès d'autres enfants s'effectue sur une base contractuelle à raison d'une heure par semaine et cette heure remplace une heure de cours. Les équipes sont formées selon trois (3) critères:

1. Un tuteur qui a réussi le programme de formation est apparié à deux (2) tuteurés.
2. Les tuteurés doivent être à un même niveau de connaissance;
3. Les filles sont regroupées ensemble ainsi que les groupes minoritaires.

Ainsi, une fille sera tutrice de deux (2) filles et ainsi de suite pour les groupes minoritaires. De cette façon, on atteint une participation très forte des filles soit cinquante-cinq pour cent (55%) ce qui est de beaucoup supérieur à ce qu'on retrouve dans des projets de même genre. On part du principe que l'apprentissage se fera plus aisément si le modèle présenté est quelqu'un qui ressemble aux tuteurés.

Trois vidéo ("Superkid") sont utilisés dans la formation, le premier place l'importance sur le contact physique avec la machine (ouvrir l'ordinateur, etc....), le second met l'accent surtout sur le monde du travail, les emplois disponibles en informatique et le troisième place l'emphase sur la socialisation par l'informatique.

L'évaluation des apprentissages se fait d'abord au début afin d'établir le niveau de base ensuite après le "tutoring".

Tous les professeurs de l'école peuvent se rendre au laboratoire et faire équipe avec un étudiant-tuteur qui est disponible. Des sessions intensives sont également offertes pour les professeurs et les enfants durant les périodes de vacances ou les fins de semaine (Ex.: Une session de deux jours en BASIC, une journée en traitement de textes, etc....). Jusqu'à maintenant trente-cinq pourcent (35%) des professeurs de l'école ont profité des services offerts par le laboratoire; il faut souligner que cette école a un roulement (turn-over) de vingt-cinq pourcent (25%) de son personnel enseignant par année.

L'équipement de laboratoire n'a rien coûté, certaines compagnies le prêtent à l'école et occasionnellement les parents organisent une journée pour recueillir des fonds afin de faire l'achat de logiciels.

Le laboratoire n'est pas actuellement associé à aucune matière scolaire en particulier. Au début les ordinateurs étaient utilisés dans les activités de mathématiques, en sciences et finalement ils ont été dissociés de toutes matières scolaires. On y enseigne un langage informatique (BASIC), le traitement de textes et le chiffrier électronique. Le traitement de textes est exploité beaucoup avec les enfants qui ont de la difficulté au niveau du langage écrit. Avec le chiffrier électronique on peut simuler des programmes dans différents champs d'activités (Ex. en économique: la voiture qui manque d'essence...). On peut également exploiter beaucoup le graphisme. L'enseignement assisté par ordinateur (computer assisted instruction) ne se développe pas et n'est pas placé en priorité à l'école parce que c'est très coûteux. Les didacticiels sont très dispendieux et souvent ne couvrent que d'infimes parties des matières scolaires enseignées. Il est également très difficile de faire un didacticiel qui apporte plus que ce que le professeur peut apporter dans son enseignement. On exploite davantage les logiciels portant sur l'espace, la musique, le graphisme. Les enfants en difficulté d'apprentissage avec un rapport maître/élève de 1/8 font beaucoup de travail au laboratoire en traitement de textes.

On enseigne le langage BASIC au lieu du LOGO par exemple, parce que le BASIC est un langage très répandu, beaucoup de programmes sont écrits en BASIC donc, le cas échéant, les enfants peuvent les modifier. L'environnement LOGO est toutefois privilégié.

Une compagnie, l'"Interactive Sciences Incorporated" agit comme support à l'école. I.S.I. est un organisme à but non lucratif dont les objectifs sont la recherche et la diffusion de l'information concernant les ordinateurs et l'éducation. La présidente de l'organisme est Mme Joan Targ et le vice-président M. Jeff Leminsky. Cet organisme a fondé avec la collaboration de l'Université Standford, l'International Institute on Microcomputers in Education. En collaboration avec l'U.S. Sports Development le "Computer Tutor Camps" a été mis sur pied. Finalement, un projet "Seniors in the Schools" où les jeunes et les personnes du troisième âge apprennent ensemble avec l'ordinateur a été mis en place.

Depuis sa fondation en 1983, I.S.I. a mis sur pied des projets de recherche auprès d'enfants handicapés physiques, des enfants aveugles et des enfants présentant des troubles au niveau de la parole et du langage (speech disorders). Un problème de financement ralentit l'évolution de ces recherches.

FAITS SAILLANTS

- Principe d'enseigner à des pairs et à des adultes.
- Image de l'éducation continue; les enfants comprennent que tout est dynamique, que les apprentissages s'acquièrent continuellement.
- Problème de hardware ne se pose pas: implication de l'industrie (prêt de matériels).
- Implication des universités (formation).
- Effritement des murs de l'école et ouverture sur la communauté;
- Pas de préoccupation EAO (CAI).

QUESTIONNEMENT

- Il n'y a pas beaucoup de temps réservé à l'exploration. L'environnement éducatif est toujours structuré.

- Le choix du "hardware" et le programme de formation sont très différents de la tangente que nous sommes en train de prendre au Québec (appareils 16 bits, LOGO, etc...).

- Implication des professeurs de l'école plutôt faible (35%).

- Expérience difficilement généralisable au niveau de l'implication des parents (70% des parents de cette école détiennent un doctorat).

2.2 MOUNTAIN VIEW-LOS ALTOS UNION HIGH SCHOOL DISTRICT

. PRESENTATION DU SCHOOL DISTRICT

Paul S. Sakamato, Superintendant

Mountain View, California.

PRESENTATION

Le Mountain View-Los Altos Union High School District a 3206 élèves du secondaire II au secondaire V. Le budget total pour le district est de 10.9$ millions. De plus, 28% des élèves proviennent de milieux minoritaires. Le School District offre aussi des cours aux adultes dont le budget ne se trouve pas inclus à celui de la clientèle régulière. Prenant pour acquis que l'information scolaire doit être partagée par les parents et les étudiants, le Mountain View-Los Altos Union High School décide de développer un projet-pilote, c'est-à-dire le Home-School Computer Network Project. Ce projet utilise l'ordinateur et le téléphone pour permettre aux étudiants et aux parents de communiquer avec la direction du collège sans pour autant quitter la maison. De plus, par ce projet, on voulait aussi éliminer le plus possible le nombre effarant de formulaires que devaient remplir les administrateurs. En même temps, on pouvait ainsi fournir rapidement des informations générales telles que:

- les résultats de l'étudiant
- la présence en classe de l'étudiant
- les disponibilités de la bibliothèque
- les activités scolaires
- éventuellement les devoirs à la maison.

Pour la direction, ce projet est intéressant parce qu'il est un moyen simple de communiquer (le téléphone), un système administratif efficace et un moyen d'intégrer les parents à un projet commun. M. Sakamoto prévoit que d'ici deux ans, 90% de la population aura un ordinateur et qu'à ce moment là le Home-School Computer Network prendra toute sa force.

POINTS SAILLANTS

- Améliorer et rendre plus efficace le système administratif et pédagogique du district.
- Rendre plus accessible l'information scolaire.
- Permettre aux parents, aux étudiants et aux administrateurs de participer à un même projet.
- Rapprocher les parents de l'école.
- Introduire l'ordinateur à la maison en permettant l'utilisation de différents ordinateurs.
- Projet très centré sur les besoins de l'administrateur et des parents.
- Ce projet nécessite des budgets.
- L'aspect de contrôle quotidien ressort comme étant prioritaire.

DOCUMENTATION A L'ANNEXE III

- Article sur the Mountain View-Los Altos Union High School District, Mountain View, California.
- Informations sur le Home School Computer Network.

2.3 MOUNTAIN VIEW-LOS ALTOS UNION HIGH SCHOOL DISTRICT

. COLLABORATION AVEC PIDOCYNE CORPORATION

Dian Brown, director Picodyne Corporation

Mountain View, California.

PRESENTATION

Le Home-School Computer Network Project est fait conjointement avec Atari Institute for Educational Action Research, Picodyne Corporation et le Mountain View-Los Altos Union High School. Ce réseau veut permettre l'accès à l'information aux parents. Il part du principe que 90% des résidents auront un ordinateur d'ici 10 ans et finalement il voudrait permettre aux conseillers de passer plus de temps avec les étudiants dans une relation personnelle.

Le Atari Institute for Educational Action Research a donné 60 000$ et le matériel Atari pour aider à la réalisation du projet. Picodyne Corporation est responsable de l'installation de l'équipement et de la conception des programmes. Finalement, le Mountain View-Los Altos Union High School fournit le personnel qui devra remettre les données de base.

Selon M. Brown, l'école ne travaille pas seule et pas seulement avec les parents mais avec l'ensemble de la collectivité. De plus, pour l'enseignement, l'ordinateur doit être vu comme un multiplicateur. Il ne doit pas remplacer l'enseignant et les logiciels qui l'accompagnent ne devraient pas montrer les erreurs mais l'apprentissage.

Enfin, pour compléter, M. Brown affirme que l'information disponible, par exemple les résultats scolaires, sont aussi en sécurité que notre argent à la banque.

POINTS SAILLANTS

- Une bonne relation de travail entre la collectivité et les compagnies.
- L'ordinateur ne remplace pas l'enseignant.
- Un bon logiciel devrait éliminer les erreurs.
- Les résultats scolaires sont autant en sécurité que votre argent à la banque.
- L'apprentissage est offert à tous.
- Le point de vue pédagogique est un peu délaissé.

DOCUMENTATION A L'ANNEXE IV

- Home School Computer Network, a Joint Venture.

2.4 MOUNTAIN VIEW-LOS ALTOS UNION HIGH SCHOOL DISTRICT

. PRESENTATION DU RESEAU: HIGH SCHOOL ET ORDINATEURS FAMILIAUX

Milton L. Schmidt, director Pupil Personnel

Mountain View, California

PRESENTATION

Le système que soutient le Home School Computer Network a d'abord été développé et par la suite seulement il a été présenté aux parents. Toutes les instances étaient présentes au niveau de la consultation, étudiants, professeurs, parents, etc. A la suite de cela, on a mis un ordinateur à la disposition des élèves pour une consultation sur place de leur dossier. Cependant, seulement quelques personnes à l'aide d'un code ont accès à certains programmes et ont la possibilité de changer les données.

L'ordinateur est aussi présent dans les écoles. Il y a deux laboratoires dans chaque école qui sont à 90% des dons. Le Ministère a aussi recommandé le cours de "Computer Literacy" et dans ce district on l'a rendu obligatoire.

Finalement, on a présenté le système informatique de la bibliothèque (qui a été conçu par un étudiant) et aussi une démonstration des différents programmes du Home School Computer Network à Mountain View et à Los Altos.

POINTS SAILLANTS

- Participation active des étudiants au système informatique de la bibliothèque.
- Projet de la bibliothèque moins élitiste que bien d'autres projets.

- Le projet d'informatisation de la bibliothèque n'aurait-il pas dû prévoir des consultations auprès de d'autres bibliothèques.

DOCUMENTATION A L'ANNEXE V

- Student Attendance and Behavior.

2.5 L'UTILISATION DE L'INFORMATIQUE AU COLLEGE DE SAN MATEO

John Avakian

College of San Mateo, San Mateo, California

PRESENTATION

Le Collège de San Mateo est un collège public fondé en 1922. Ayant atteint plus de 20 000 étudiants en 1960, il est divisé en trois campus: Collège de Canada, Collège de Skyline et celui de San Mateo. Le campus de San Mateo accueille près de 8 000 étudiants le jour et presque autant le soir. Il dispense également des cours en industrie. Il offre d'ailleurs 54 programmes professionnels. Tous les cours sont actuellement reliés à un ordinateur central (main frame). L'intérêt particulier de ce collège est qu'il utilise plusieurs techniques pour son enseignement.

1. Cours télévisés en informatique

Personne-ressource: M. Stuart Cheifet

Les cours télévisés offerts par ce collège sont réalisés grâce à l'implication de l'entreprise privée. Après avoir réalisé des cours d'introduction à l'informatique, "Making Account" et "New Literacy", l'équipe de production, en collaboration avec plus d'une centaine d'organismes, vient de terminer la réalisation d'un cours avancé en informatique, présenté comme les autres au réseau PBS (réseau d'éducation américain), appelé "The Computer Chronicles". Ces émissions sont présentées 2 fois par semaine à raison de 2 périodes de 30 minutes chacune. Plus de 25% des gens enregistrent ces émissions sur magnétophone vidéo.

Le principal intérêt de ces cours est qu'ils sont liés à la base d'information Compuserve à laquelle peuvent référer les personnes pour obtenir un complément d'informations sur le cours.

2. Enseignement informatisé des mathématiques

Personne-ressource: M. Frank Young

L'enseignement informatisé des mathématiques, méthode utilisée depuis trois (3) ans, sert à résoudre les difficultés d'un étudiant soit à l'entrée comme cours d'appoint, soit en cours d'études alors qu'il ne peut pas suivre le déroulement normal du cours. Dans ce dernier cas, il peut prendre jusqu'à deux (2) ans pour cheminer librement et individuellement à travers les modules d'apprentissage. Aucun examen ne sanctionne le cours mais une attestation est donnée; il n'y a donc pas d'unité de crédit pour l'université.

Ces cours ont éte réalisés en groupe multidisciplinaire et comportent une série de modules dont la liste apparaît en annexe VI.

3. Cours de sciences informatiques (C.I.S.)

Personnes-ressources: M. Ed. Rategan et Ardas Ozsogomonyan

Plus de 4 000 étudiants sont inscrits aux cours d'informatique; ces cours ont un tel succès parce qu'ils coûtent moins cher que ceux offerts par l'université. Ces cours sont ou bien terminaux, donnant accès au marché du travail, ou bien une partie d'un programme; ils peuvent ainsi être reconnus et crédités par les universités d'état.

Les cours offerts sont les suivants:

- cours de langages;
- conception de programmes: "design"; cours préalables à tous les autres cours;
- cours d'opération d'ordinateur;
- cours d'application;
- cours d'analyse et de programmation.

La tendance est maintenant à laisser la programmation au profit de programmes outils tels le traitement de textes, le chiffrier électronique, les bases de données et les programmes de graphique .

La micro-informatique prend de plus en plus d'importance aux dépens des gros systèmes. De même, les bases de données et la télécommunication font partie des nouvelles orientations.

4. Cours en sciences administratives

Personne-ressource: Mme Sandra Mellor

Le Collège de San Mateo prépare de nouveaux cours pour répondre au fait que les étudiants sont mieux préparés en informatique, que l'ordinateur est vu comme un outil et que la micro-informatique est présente dans les bureaux et les industries.

Ce nouveau programme a bénéficié d'une subvention du Vocational Education Agency qui a fourni 60% du budget et d'un don de 20 IBM pc et de 5 imprimantes. On retrouve dans ce programme des cours de traitement de textes (Text Editor), de base de données, de chiffrier électronique et de programme de graphiques.

5. Système centralisé de registrariat

Personne-ressource: M. John Mullen

Le système de registrariat centralise l'administration des trois (3) campus. Il repose essentiellement sur une base de données et a la structure suivante:

```
                              programmes
                                  :
                                  :
                           contenu de cours
                                  :
                                  :
(finances)--------employés---------cours-campus---------locaux-horaire
                                  :
                                  :
                         dossier des étudiants
```

6. Formation interactive en électronique

Personne-ressource: M. John Avakian

Cette partie de la formation est tellement importante que c'est une compagnie du Wisconsin qui fait le marketing de ces vidéos; plusieurs industries utilisent ces documents pour la formation individuelle de leurs employés. Chacun des modules est composé comme suit:

1. pré-test;
2. lecture de documents;
3. vérification des connaissances acquises;
4. vidéo interactif:
   - . gestion de l'apprentissage;
   - . vérification par test
     renforcement ou nouvelle explication
     répétition possible;
   - . révision;
   - . test final du module
     questions aléatoires
     note de passage: 90%
     trois essais possibles.

DOCUMENTATION A L'ANNEXE VI

- Computer Assisted Instruction Modules for Vocational Students.

MODULE 3

LES SERVICES DISPONIBLES

3.1 THE MATH AND COMPUTER EDUCATION PROJECT (M.C.E.P.)

Lawrence Hall of Science, University of California, Berkeley

PRESENTATION

Le M.C.E.P. est un projet ayant comme buts de sensibiliser, développer et rendre accessibles les utilisations pédagogiques de l'ordinateur. Le projet vise principalement les parents, les éducateurs et les élèves.

Afin d'atteindre leurs buts, l'équipe organise des ateliers de travail sur les ordinateurs pour les parents et enfants, du perfectionnement pour les éducateurs et enfin développe des didacticiels pour le niveau primaire.

POINTS SAILLANTS

- Le projet se veut plus un centre de développement et de perfectionnement qu'un centre de recherche.
- La stratégie qui se dégage de leurs actions consiste à produire du matériel, organiser des sessions où les participants utiliseront le matériel, et observer les résultats. Leur travail est donc axé sur la production et la diffusion et peu sur l'évaluation.
- Un des points intéressants du projet est sa clientèle. De fait, le projet n'est pas seulement destiné aux enseignants mais aussi aux parents. D'ailleurs, l'équipe offre beaucoup d'ateliers enfants/parents. Les parents sont donc initiés aux A.P.O. en même temps que leurs enfants et les éducateurs.

- Le matériel produit (essentiellement des jeux éducatifs) est généralement très bien présenté. L'animation, la couleur, le dessin, le son, etc. sont largement utilisés dans chaque didacticiel. Quant à la facilité d'utilisation, là aussi nous retrouvons un souci de respecter le plus possible les utilisateurs, soit les enfants. La présentation pédagogique pour les éducateurs ou les parents est par contre inexistante sur la disquette. Quant à la documentation écrite, elle existe mais elle a comme objectif de présenter le matériel et non d'être un guide pour éducateurs ou parents.

QUESTIONNEMENT

- Le matériel est produit sans se préoccuper systématiquement des conséquences sur l'apprentissage. Cette stratégie de produire et d'améliorer à partir de l'utilisation, est-elle acceptable dans un contexte d'éducation?
- Si cette stratégie s'avérait acceptable, ne devrions-nous pas retrouver une évaluation systématique avec grilles, critères, observateurs impartiaux, etc.?
- L'équipe du M.C.E.P. semble évaluer, dans leur observation, les attitudes et les intérêts des enfants, est-ce suffisant?

DOCUMENTATION A L'ANNEXE VII

- Présentation des objectifs et des pratiques du M.C.E.P.
- Dépliant sur les didacticiels développés.

3.2 COMPUTER LITERACY

Arthur Luehrmann

Lawrence Hall of Science, University of California, Berkeley

PRESENTATION

A) Le travail de Luehrmann est dirigé principalement sur le développement de matériels didactiques pour l'enseignement de la science informatique au niveau secondaire (computer literacy).

Selon lui, il existe, dans les écoles américaines, des difficultés d'implantation des cours sur l'initiation à la science informatique. Les principales étant:

1. l'installation du "hardware" (ce manque semble de plus en plus comblé);
2. la diffusion de logiciels;
3. documentation pour les cours (curriculum matériel);
4. la formation et le perfectionnement pour les enseignants.

Pour sa part, il se concentre sur les deux derniers points.

B) Pour Luehrmann, plusieurs raisons justifient l'importance que nous devons accorder à cette nouvelle matière. Les principales sont:

1. Plus de 30 millions d'américains verront leur travail influencé et en grande partie transformé par l'informatique.
2. Le travail manuel se verra de plus en plus assumé par des robots.
3. Plus de la moitié des collets blancs verront leur travail s'informatiser.

4. La plupart des nouveaux emplois demanderont une compétence en informatique.

5. La pression de la société se fera de plus en plus grande sur le monde de l'éducation pour qu'il considère l'informatique comme un curriculum très important.

C) Son choix du langage BASIC, comme langage informatique, en est un de compromis. Il préfère PASCAL, mais compte tenu que tous les micro-ordinateurs "parlent" en BASIC, il a décidé de fonder son matériel principalement sur ce langage.

"Because is there, not because is good". Il prétend quand même qu'il est possible d'enseigner la programmation structurée avec BASIC. (Voir documentation annexée).

D) Dans un curriculum d'initiation à la science informatique, l'accent doit être mis sur la programmation. Avec la programmation, il est possible d'atteindre des objectifs pédagogiques de haut niveau du type analyse, synthèse, évaluation.

En fait, le but n'est pas de former des programmeurs mais de se servir de la programmation pour développer des habilités à la résolution de problèmes. Comme l'enseignement de l'écriture n'a pas pour but de former des écrivains mais d'habiliter les étudiants à communiquer clairement leurs idées.

E) Le cours qu'il propose à travers son matériel est structuré de telle façon qu'à chaque bloc de cours, les étudiants ont à atteindre deux types d'objectifs: cognitifs (principalement d'habilitation) et affectifs (principalement de sensibilisation).

POINTS SAILLANTS

- L'auteur semble se préoccuper de relier l'apprentissage à l'école avec son prolongement dans un autre environnement tel que la maison. Par exemple, son choix de prendre le langage BASIC est bien sûr basé sur les possibilités et les capacités des ordinateurs des écoles, mais aussi de ceux que nous retrouvons dans les maisons.

- Selon Luehrmann, l'Est des Etats-Unis et le Canada ne sont pas en retard sur la Californie en ce qui a trait aux A.P.O. Par contre, un phénomène joue en faveur de la Californie, c'est la pression que les parents font sur le milieu de l'éducation pour l'implantation de l'informatique dans les écoles. La pression est tellement forte que les enseignants n'ont pas le choix, ils doivent "embarquer".

- Luehrmann croit qu'il est important, dans un cours axé sur la programmation, que les étudiants suivent le même rythme dans l'acquisition d'habiletés. Ceci afin qu'ils puissent s'entraider, se soutenir et non s'isoler.

QUESTIONNEMENT

- Dans la présentation du matériel développé, nous retrouvons un contenu informatique bien structuré. Il est difficile, par contre, d'y déceler une théorie et une approche pédagogiques. Existent-elles?

- Sa structure de contenu est découpée en blocs bien circonscrits. Il y a danger, dans ce genre de structure, de perdre l'inter-relation entre toutes les parties. Le morcellement ne devient-il pas alors une stratégie à éliminer dans un cours d'initiation à la science informatique?

DOCUMENTATION A L'ANNEXE VIII

- Luehrmann, Arthur, "Slicing Through Spaghetti Code".

3.3 TEACHER EDUCATION AND COMPUTER CENTER (T.E.C.C.)[1]

Le Roy Finkel, Janice Marshall

San Mateo, California

PRESENTATION

En 1980, des professeurs se regroupent sous le nom de Computer Users Educators (CUE); leur objectif est de ramasser en un même lieu un grand nombre de logiciels éducatifs et d'en faire l'évaluation. Ce sont d'abord autour des logiciels de Commodore qu'ils travaillent. Ils veulent les rendre accessibles gratuitement. A partir de ce groupe de professeurs, le centre régional (T.E.C.C.) sera formé; cette intention de mettre en commun les logiciels du domaine public, donc gratuits, apportera des dons d'une trentaine d'ordinateurs de marques diverses et des périphériques nécessaires.

1. Procédure

Lorsque les programmes sont reçus, ils sont d'abord évalués; puis, s'il y a lieu, ils sont révisés, modifiés selon des standards établis, enfin distribués par reproduction.

Selon M. Finkel, il n'y a pas de grands programmes dans ces logiciels gratuits, mais il y en a des bons. Les "déchets" sont éliminés. En mettant ces programmes à la disposition des professeurs le centre ne veut pas faire concurrence à l'entreprise privée mais donner un départ.

Le centre est ouvert à tous les lundis en après-midi; pendant les autres jours de la semaine, on recommande de prendre rendez-vous.

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1. Le département de l'éducation a présenté le projet des T.E.C.C.; voir présentation, page 3 et l'annexe II.

5. Questions

Drill and Practice

M. Finkel considère que ces programmes sont des "déchets" même s'ils représentent de 10 à 15% de l'ensemble des programmes du centre. Cependant, il pense que la nouvelle façon de les utiliser entraîne un jugement moins sévère.

LOGO

Il n'est pas un fanatique du langage LOGO; il croit toutefois, contrairement à M. Papert, que l'on doive suggérer à l'enfant des idées et restreindre ainsi un peu sa création. Ces suggestions peuvent venir de l'utilisation de posters qui servent de guide. Il ajoute aussi que les professeurs ont peur du LOGO parce que les élèves vont "trop vite".

Meilleures compagnies de logiciels

M. Finkel prépare un article à paraître dans Popular Computing sur les meilleures compagnies de logiciels:

Sunburst
MECC (Minnesota Educational Computer Center)
Learning Company
Development Learning Materiel
Computer Advanced Ideas
Scolastik

Dans l'ensemble, il considère qu'il y a 70% de ce qui a été fait de mauvais, MAIS que maintenant, il y a 70% de ce qui se fait qui est bon. Il y a donc une grande amélioration de la qualité des logiciels.

Il ajoute cependant que la critique évolue toujours selon l'évolution de la technologie.

Enseignement de l'informatique

De 1966 à 1981, M. Finkel a étudié la programmation d'ordinateurs. Cependant il s'interroge sur la nécessité de continuer à enseigner

3.3 TEACHER EDUCATION AND COMPUTER CENTER (T.E.C.C.)(1)

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1. Le département de l'éducation a présenté le projet des T.E.C.C.; voir présentation, page 3 et l'annexe II.

2. Influence du centre

Le centre est un centre où les professeurs peuvent aller faire l'essai de logiciels. Ce fait entraîne une influence assez grande sur les achats de logiciels. D'ailleurs, une sélection de 700 programmes est faite par plusieurs organismes et publiée annuellement sous le titre de Preview Guide; ce n'est pas un guide d'achat mais bien une indication par où commencer sa propre évaluation des logiciels existants que M. Finkel évalue entre 8 000 à 10 000 en éducation seulement.

De plus, le centre s'est engagé dans une pression auprès des administrateurs de l'éducation pour le respect du copyright. Aussi le centre garantit-il la légalité de la reproduction des logiciels qui y sont exposés et engage les administrations scolaires à faire de même. "Si l'entreprise privée ne fait pas d'argent comment pourra-t-elle produire des logiciels de qualité". Le centre est un endroit pour essayer des programmes.

Enfin, comme le centre fait des critiques des programmes disponibles, certaines compagnies de logiciels viennent consulter le centre pour vérifier ce qui ne va pas dans leurs produits.

3. Contenu du centre

Le centre est une librairie qui contient des ordinateurs de marques diverses pour permettre l'essai de logiciels en les rendant accessibles. De plus, il offre une grande documentation sur l'enseignement et l'utilisation de l'informatique de même que des catalogues. Cependant, aucune documentation ne peut sortir du centre.

4. L'avenir

Le centre fait actuellement des pressions pour que les gouvernants prennent position sur l'enseignement de l'informatique. De plus, il encourage les autres régions à partir de ce qui a été fait là. Enfin, il veut se tenir à jour sur le développement de la technologie qui évolue constamment.

5. Questions

Drill and Practice

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Il ajoute cependant que la critique évolue toujours selon l'évolution de la technologie.

Enseignement de l'informatique

De 1966 à 1981, M. Finkel a étudié la programmation d'ordinateurs. Cependant il s'interroge sur la nécessité de continuer à enseigner la programmation alors qu'il n'y a que 200 000 emplois de programmeurs qui seront disponibles. Il faudrait plutôt enseigner le traitement de textes, les bases de données et les chiffriers électroniques. Il avoue cependant qu'il a écrit 10 volumes de programmation et qu'ils se vendent bien.

Professeurs et informatique

Il est utopique de demander aux professeurs de fabriquer des logiciels; les enseignants ne sont pas de bons concepteurs de programmes et ils n'ont pas le temps nécessaire. En supposant un salaire annuel de 30 000$, il en coûterait 6 000$ pour consacrer une heure par jour à la programmation; ce n'est pas très rentable. En considérant l'utilisation de programme de type "shell program" - il faut environ 20 heures de travail pour chaque heure d'utilisation - c'est donc une voie plus intéressante que les 450 heures nécessaires à la programmation d'une heure de logiciel.

3.4 COMPUTER USING EDUCATORS (CUE) *et* TEACHER EDUCATION AND COMPUTER CENTER (T.E.C.C., SANTA CLARA)

Jim Mc Cauley (spécialiste en A.P.O.)
Glee Catheart (enseignante utilisant l'ordinateur)

Santa Clara County Office, Santa Clara

PRESENTATION

La présentation a porté sur deux points: CUE et sur le service d'aide aux enseignants.

L'association CUE est une association qui a ses principales activités au niveau de ses chapitres. Il existe des chapitres un peu partout aux U.S. et au Canada anglais. Ces chapitres regroupent en tout de 7 000 à 8 000 membres, principalement des enseignants.

Les activités (conférences, ateliers, etc.) sont axées sur la diffusion d'informations par et pour les utilisateurs d'A.P.O. A ce titre, il faut surtout voir CUE comme une association axée sur le besoin de ses membres plutôt qu'une association de prestige.

Actuellement, deux politiques sont prônées par CUE. D'abord, elle est pour le respect intégral des copyrights et par le fait même permettre aux compagnies privées de réussir à créer de bons didacticiels.

Par la suite, CUE fait pression pour qu'il existe de plus en plus une compatibilité entre les ordinateurs utilisés dans les écoles.

Enfin, il est important de noter que CUE est une association qui n'est pas subventionnée et qui ne dépend d'aucun organisme public. Elle est gérée par les enseignants.

Le service d'aide aux enseignants fait partie du réseau des T.E.C.C. (voir page 3). Plus spécifiquement, celui de Santa Clara offre les services suivants:

- ordinateurs variés (Apple, Atari, Commodore, Radio-Shack)
- des logiciels et des didacticiels pour fins d'évaluation
- un service de perfectionnement
- un lieu d'échanges et de rencontres.

POINTS SAILLANTS

Ce qui ressort des interventions qu'ils ont réalisées dans leur service depuis deux ans est:

- Les enseignants sont dans l'ensemble, dévalorisés par la société californienne. Alors il devient difficile de leur demander un surcroît de travail pour l'intégration des A.P.O.
- Il y a une distinction à faire entre le perfectionnement donné à travers le service d'aide et le perfectionnement universitaire. Le premier est axé principalement sur de l'information concernant l'informatique pendant que le deuxième se situe plus au niveau de l'intégration de l'ordinateur dans un ensemble pédagogique.
- Pour eux, il est illusoire de penser que les enseignants vont créer du matériel. C'est aux compagnies privées de s'en charger.

QUESTIONNEMENT

- Quel est vraiment le rôle que l'enseignant doit jouer dans les A.P.O.?

DOCUMENTATION A L'ANNEXE IX

- Feuille de présentation du service d'aide aux enseignants.
- The California Challenge
- Writing a formal proposal to obtain microcomputer funding.

3.5 THE LEARNING COMPANY

Terri Perl, Suzanne Walldorf, Ann Piesturp

PRESENTATION

The Learning Company est une compagnie privée dont la principale fonction est la production de didacticiels éducatifs. Elle a été fondée en 1979 par Ann Piesturp. La fondation de cette compagnie a été réalisée grâce, entre autres, à une subvention de Apple Education Foundation. The Learning Company embauche présentement 30 personnes et elle produit 5 ou 6 didacticiels par année. Un didacticiel coûte à la compagnie entre 300 000$ et 500 000$.

(Pour des informations détaillées concernant les origines de The Learning Company, son fonctionnement et les didacticials déjà sur le marché, voir à l'annexe X: "The Learning Company Backgrounder").

The Learning Company ne fait pas elle-même la promotion et la distribution de ses produits. A ce sujet, elle travaille avec de grandes compagnies telles Addison-Wesley, American Express, IBM, Simon and Schuster. Cependant, The Learning Company a l'entière responsabilité de la planification et de la production des didacticiels. Elle sssume également la réalisation des guides de l'usager.

Lors du développement du matériel, The Learning Company suit toujours le même processus. Dans une équipe, des idées sont énoncées et discutées et, dans un second temps, ces idées sont développées sous la forme d'un didacticiel. Par la suite, ce didacticiel est expérimenté auprès d'un échantillon de la population cible et les réactions des enfants sont évaluées systématiquement.

Dans un quatrième temps, le matériel est revu et corrigé en tenant compte de l'expérimentation de la troisième étape. Généralement, à la quatrième étape, le produit en est à la version finale.

Le matériel produit tient compte des théories de l'apprentissage et de la psychologie cognitive. Il s'inspire énormément des données issues de la théorie de Jean Piaget. Le contenu du didacticiel progresse toujours du simple au complexe, du concret à l'abstrait. Les temps d'exploration sont suivis de temps d'exercice et de systématisation. L'organisation du contenu est fondamentalement hiérarchique.

The Learning Company veut aller beaucoup plus loin que l'enseignement assisté par ordinateur et créer du matériel qui permettrait le développement d'habiletés cognitives de haut niveau (pensée conceptuelle, pensée logique, etc...). Son objectif est de créer quelque chose qui est vraiment inédit.

Pour The Learning Company, le "key market" est le marché de l'éducation et le "target market" est le milieu familial. Selon les membres de cette compagnie, il semble clair que les enseignants n'auront jamais le temps de faire des didacticiels éducatifs et ils veulent les réaliser pour eux. Il en est ainsi pour les parents.

Suite à des questions des participants au voyage d'étude, il ressort que:

1. Tous les produits de The Learning Company sont expérimentés et évalués avant d'être publiés.
2. Il n'y a pas lieu de créer du matériel différent pour les enfants doués ou surdoués.
3. Les milieux scolaires évaluent très positivement les produits de The Learning Company.
4. Il est important pour une compagnie de production de faire équipe avec une (ou des) compagnie(s) de distribution.
5. Dans les bibliothèques pour enfants, il doit y avoir des livres et des didacticiels.

POINTS SAILLANTS

- Le matériel semble très attrayant pour les enfants.

- Les activités proposées sont très bien graduées et hiérarchisées.

- L'aspect ludique occupe un rôle très important.

- Le matériel est simple (ce qui ne signifie pas facile).

- Il y a fréquemment des textes assez longs à l'écran. Cet aspect pourrait rendre la tâche très complexe pour les usagers.

DOCUMENTATION A L'ANNEXE X

- "The Learning Company Backgrounder".

3.6 EDUPRO COMPANY

William Paisley, professor, University of Stanford,
co-propriétaire de la Compagnie Edupro

Palo Alto, California

PRESENTATION

La compagnie EDUPRO a pour objets principaux:

1. La confection et l'évaluation de didacticiels.
2. La formation des enfants soit, durant l'année scolaire ou soit, dans le cadre de camps d'été.
3. La formation des parents.
4. La formation de professionnels et d'industriels.

Les enfants peuvent venir au laboratoire dès l'âge de quatre (4) ans. On les entraîne d'abord à écrire ou à raconter une histoire; dans un deuxième temps on leur apprend à programmer le scénario.

Les petits de quatre-cinq (4-5) ans, trop jeunes pour programmer, utilisent un robot qu'on appelle TOPO. TOPO peut danser, avancer, reculer, tourner à gauche ou à droite. Ce robot est l'équivalent de la TORTUE en LOGO, il est d'ailleurs programmé en langage LOGO.

Avec TOPO, on utilise beaucoup la technique du modelage (observation-imitation) tirée des théories de l'apprentissage social, pendant qu'un enfant est en interaction avec TOPO, d'autres enfants observent et reproduisent ensuite les comoortements observés. TOPO est calibré en centimètres; six (6) pas (par exemple, en avant de 6 - Forward 6) équivaut à 750 cm.

Avec des enfants d'âge scolaire, certains ordinateurs sont aménagés avec un système de quatre (4) manettes (joysticks) de façon à faire travailler quatre (4) enfants en même temps, sur un même programme. Ça pourrait par exemple être un programme d'addition à deux (2) chiffres où les résultats de chaque enfant sont enregistrés au fur et à mesure sur l'écran. Un élément compétitif peut entrer en ligne de compte.

En général, pour que l'expérience rapporte aux enfants, il faut, selon le Dr Paisley, prévoir entre deux (2) à trois (3) heures par semaine de travail sur l'ordinateur. Soulignons que l'enfant américain regarde en moyenne la télévision quatre (4) heures et demie par jour.

Les enfants travaillent à la fois à l'apprentissage de langage informatique (computer literacy) et sur des didacticiels portant sur des matières scolaires.

Selon le Dr Paisley, l'apprentissage d'un langage comme BASIC ou LOGO améliore la capacité de penser (thinking ability); il y a fort probablement un transfert d'apprentissage mais tout ceci reste à être démontré expérimentalement.

De façon générale, on essaie d'enseigner aux enfants des FAITS et des PROCEDURES. L'école enseigne bien les faits. Mais les PROCEDURES ou la pensée algorithmique (Algorithmic or procedural thinking) c'est plus difficile à enseigner à l'école. Dans un processus de solution de problèmes, une procédure comprend, la classification du problème, le choix de la solution et l'application de la solution. Quand on enseigne la programmation, l'étape de la construction de l'ordinogramme (flowchart) est très importante. L'apprentissage mécanique d'un langage informatique n'est pas à recommander; on doit davantage travailler sur les procédures (pensée algorithmique) et être préoccupé par le transfert d'habiletés. L'enseignement de l'ordinateur doit passer par des apprentissages techniques, par exemple, la maîtrise du clavier.

A la fin du siècle, le Dr Paisley prévoit une stabilisation de la demande pour de la quincaillerie (hardware) et une augmentation de la demande pour des logiciels (software). D'ici à l'an 2000, l'augmentation de la demande pour des logiciels se fera à un rythme de 50% annuellement. Il va falloir prévoir des "lignes d'assemblage" avec différents spécialistes: son, graphisme, etc... Un didacticiel devrait apporter plus qu'un livre; un livre c'est quelque chose de statique pendant qu'un didacticiel est dynamique. Par exemple, avec le développement des vidéo-didacticiels on peut simuler des expériences de physique, de chimie, etc... ce qu'un livre ne peut pas faire. Il faut se rappeler qu'un bon didacticiel doit être utilisable sans livre (textbook) et qu'il doit contenir des renforçateurs positifs. La taxonomie des didacticiels comprend quatre (4) dimensions:

1. l'exercice (drill and practice);
2. le tutoriel (tutorial);
3. la simulation;
4. les programmes axés sur la créativité et la découverte (discovery program).

QUESTIONNEMENT

- Environnement LOGO sur du matériel structuré.
- Même pour les plus petits, le robot TOPO fait un peu "gadget".
- L'ordinateur doit améliorer le matériel disponible sous d'autres formes, non pas simplement le répéter.
- A propos des didacticiels, quelle devrait être l'implication du professeur dans leurs confections?

3.7 APPLE COMPANY

Sue Talley, Lola Gustenburger, Catherine Numes, Daunna Minnich, Carolyne Stauffer

Cupertino, California

PRESENTATION

Dans un premier temps, Mme Sue Talley a présenté quelques caractéristiques de la Compagnie Apple:

1. Les employés de la Compagnie Apple voient leur participation à cette compagnie comme une aventure. En général, ils y travaillent entre 80 et 90 heures par semaine.

2. Les employés de la Compagnie Apple ont l'impression de constituer une grande famille centrée sur la création du futur. Leurs produits sont présents partout dans le monde et ils sont conçus pour créer le futur. Cet esprit familial est présent dans la planification, la production et la distribution.

3. La Compagnie Apple se donne pour mission d'accroître les capacités ainsi que les habiletés des individus grâce à l'utilisation de l'ordinateur personnel.

Les productions et les comportements de la Compagnie Apple sont générés par les principes suivants:

1. La création du futur
2. L'innovation
3. L'excellence et la qualité
4. Le risque.

Les produits de la Compagnie Apple sont utilisés dans des buts très variés:

1. Le marché de l'éducation.
   (La Compagnie Apple a, entre autres, donné 9 000 micro-ordinateurs aux écoles de la Californie dans le cadre du programme "Kids can't wait").

2. Le marché de la consommation: les banques, les magasins, les centres récréatifs.

3. Le marché de la moyenne et de la petite entreprise.

4. Le marché de la grande entreprise.

5. Le marché scientifique.

6. Le marché du commerce international.

Sur le plan de l'éducation, 50 à 60% des écoles américaines qui possèdent des micro-ordinateurs ont acheté des produits Apple. De plus, 66% des didacticiels éducatifs disponibles sont compatibles avec les produits Apple.

La Compagnie Apple ne développe pas de logiciels ou de didacticiels. Elle est centrée sur la production d'instruments (hardware) puissants et efficaces. De plus, elle est préoccupée par la démonstration, et conséquemment la compréhension chez les utilisateurs, des possibilités et de l'efficacité de ses produits. Il est essentiel que les usagers sachent comment utiliser la puissance du produit concerné (ex.: Apple presents Apple).

En ce qui concerne les logiciels et les didacticiels, la Compagnie Apple entretient des relations significatives avec des compagnies productrices. Dans la recherche de la qualité en regard du matériel produit, la Compagnie Apple a confectionné une grille d'évaluation (annexe XI). Chaque produit, dans la mesure où il est publié, est évalué par des membres de la Compagnie Apple et cette dernière peut participer à la promotion du matériel. Occasionnellement, la Compagnie Apple publie Journal of Courseware Review qui poursuit des fins de promotion.

De plus, la Compagnie Apple a mis en place un regroupement appelé "Software Interrelation Publishers" qui comprend actuellement 1 000 membres. Ces membres accrédités peuvent participer à des ateliers de formation et d'information et ils bénéficient d'un rabais à l'achat de produits Apple. Pour être membre de ce regroupement, il faut, entre autres, avoir produit du matériel agréé selon les critères d'évaluation de la Compagnie Apple.

Dans toutes ses démarches d'évaluation et d'acceptation ou de rejet des produits éducatifs des autres compagnies, la Compagnie Apple prend en considération que le matériel produit doit correspondre autant aux besoins éducatifs de la maison que de l'école.

Jusqu'à ce jour, il semble que 24 000 programmes aient été publiés par des compagnies indépendantes.

Du côté de l'éducation, la Compagnie Apple, 6 mois après avoir reçu son incorporation, a mis sur pied en 1979 "Apple Education Foundation". Durant les trois premières années de cette fondation, les subventions accordées étaient nombreuses, mais les argents donnés à chaque projet étaient peu élevés. Il s'agissait de semer des idées et de provoquer des discussions. Dans le cadre des nouveaux programmes, la Compagnie Apple favorise des subventions où les argents octroyés sont plus élevés. Ces nouvelles subventions sont accordées pour des projets axés sur l'utilisation innovatrice des micro-ordinateurs ainsi que sur l'exploitation de leur puissance et de leur efficacité.

En novembre 1983, la Compagnie Apple a fondé "Apple Canada Education Foundation". Dans le cadre de cette fondation, la Compagnie prévoit donner 40 Macintosh et 70 Apple IIe. (La liste des membres du comité aviseur est présentée à l'annexe XI). Dans le cadre de la fondation canadienne, 30% des projets reçus jusqu'à maintenant concernent le traitement de textes.

En réponse à des questions de la part des membres du voyage d'étude, il ressort que:

1. Sur le plan de l'éducation, la Compagnie Apple perçoit que l'Apple IIe peut être utilisé efficacement à l'école primaire et secondaire tandis que le Macintosh peut être employé avec efficacité au niveau collégial et universitaire.
2. La souris est disponible pour la famille Apple IIe.
3. L'utilisation du vidéo couleur est le prochain pas significatif dans la micro-informatique.
4. La Compagnie Apple peut démontrer comment utiliser les appareils qu'elle produit, elle ne peut cependant pas démontrer comment les utiliser dans la classe.
5. Il y a un Macintosh fabriqué à toutes les 29 secondes et il n'y a qu'un seul employé à la chaîne de montage.

DOCUMENTATION A L'ANNEXE XI

- "A Well Designed Educational Program".
- "The Apple Education Foundation".

MODULE 4

LE PERFECTIONNEMENT ET LA RECHERCHE

4.1 ASSESSING THE COGNITIVE CONSEQUENCE OF COMPUTER ENVIRONMENTS FOR LEARNING (ACCCEL)

Corinne Nelson

Lawrence Hall of Science, University of California, Berkeley

PRESENTATION

Le projet de recherche a pour but d'évaluer l'impact de l'utilisation de l'ordinateur sur les habiletés cognitives (cognitive skills).

Plus précisément, la recherche tente de mesurer si les étudiants ayant des aptitudes, des styles d'apprentissage différents et des vécus différents peuvent atteindre des habiletés cognitives de hauts niveaux et des connaissances, grâce à l'environnement pédagogique de l'ordinateur (computer learning environments)(1).

Pour les chercheurs, le "computer learning environments" se caractérise par: l'interaction, la précision, la continuité, le "challenge", le raffinement et la possibilité de cheminements d'apprentissage multiples.

Les chercheurs s'intéressent à trois types d'environnement pédagogique: lorsque l'étudiant se retrouve en situation où il doit programmer; lorsqu'il utilise des simulations et des jeux; lorsqu'il se fait offrir de la matière sur ordinateur (ex.: tutoriel ou exercices répétitifs).

Pour les chercheurs, les habiletés cognitives de hauts niveaux qui les intéressent sont: la planification, le raisonnement inductif et le raisonnement déductif.

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1. Pour plus de précisions, nous suggérons au lecteur de lire dans le document ACCCEL à la page II de l'annexe II, l'énoncé en anglais.

QUESTIONNEMENT

- Peut-on prétendre, comme le font les chercheurs, que l'ordinateur à lui seul, peut créer un environnement éducatif?

- Quelle importance l'enseignant (ou le parent) joue-t-il dans l'environnement pédagogique de l'ordinateur?

DOCUMENTATION A L'ANNEXE II

- ACCEL par Dr Marcia Linn et Dr Charles Fisher.

- Promise and Reality in Computer Education par Marcia Linn et Joanne S. Stein.

- ACCCEL Research Reports.

4.8 PACIFIC STUDIES CENTER

Lenny Siegel

Palo Alto, California

PRESENTATION

Le Pacific Studies Center a été fondé en 1969 par un groupe de personnes activement engagées dans la contestation de la guerre du Vietnam.

Selon M. Siegel, la technologie elle-même n'est pas un problème; le problème réside au niveau de la façon d'introduire la technologie et au niveau de l'utilisation. Actuellement, la façon dont la technologie est utilisée conduit à un processus de "de-skilling". Elle élimine le besoin de personnes "skill". A titre de démonstration, il a présenté l'exemple de la caissière de McDonald qui n'a pas besoin de connaître le prix des produits vendus parce qu'ils sont nommés sur la caisse enregistreuse. La caissière n'a même plus besoin de savoir compter parce que toutes les informations lui sont dictées par la machine. Une telle utilisation de la technologie détruit les habiletés acquises par les travailleurs. Elle pourrait également provoquer la disparition de la classe moyenne.

M. Siegel perçoit également l'utilisation des jeux vidéos comme un processus de "de-skilling". Ces jeux ne requièrent qu'une bonne coordination oeil-main. Les usagers des jeux vidéos seront les employés futurs de McDonald.

L'ordinateur a une place très importante à l'école puisque c'est le seul endroit où les enfants de la classe ouvrière peuvent interagir avec lui. Toutefois, il semble évident que les enfants de la classe bourgeoise, étant donné la présence d'ordinateur(s) à la maison, seront toujours gagnants dans l'interaction avec l'ordinateur.

M. Siegel insiste sur le fait que le "computer literacy" n'est pas suffisant pour les citoyens de demain. Il faut travailler sur le "computer citizenship", c'est-à-dire sur le comment utiliser l'ordinateur, sur l'entraînement. Cette distinction devrait être très explicite dans son prochain livre: "Where the Chips May Fall?"

Suite à des questions des participants au voyage d'étude, il ressort que:

1. Il ne faut pas se laisser impressionner par la déclaration que tous les gens auront un jour un ordinateur.
2. Très peu de curriculum sur l'ordinateur dépasse ce que l'enseignant a toujours fait à l'école.
3. Les enfants qui apprennent à programmer à l'école seront les employés les plus "skill" dans le monde de demain.

DOCUMENTATION À L'ANNEXE XIII

- "Silicon Valley: Paradise or Paradox?"

4.3 UNIVERSITY OF STANFORD

Decker Walker, professor

Palo Alto, California

PRESENTATION

I Historique

- En 1960, début des applications pédagogiques de l'ordinateur (enseignement tutoriel et programmé).
- Il y a 25 ans, nous avons été les pionniers dans ce domaine, notre expertise va au-delà de 20 ans.
- 1970, fin des fonds publics; ce qui nous a conduit à un virage important.
- Les compagnies privées ont alors suppléé et complété nos besoins afin que nous puissions poursuivre notre travail.
- Une corporation privée fut créée faute de fonds gouvernementaux pour mener à bien notre expérience.
- Nous avons mené une expérience de 3 ans dans une école près de Palo Alto, nous étions branché au gros ordinateur de l'Université de Stanford par MODEM.
- Ce fut un succès pédagogique pour nous; les enfants ont adoré l'expérience.
- Nous avions 20 à 30 terminaux, nous les utilisions en anglais et en mathématiques, notre clientèle était âgée de 8 à 11 ans et nous utilisions les ordinateurs environ 15 minutes par cours.
- Notre langage de programmation, le BASIC.

- Notre évaluation: 30% de nos enfants sont plus forts dans ces matières que les enfants qui ont appris sans ordinateur. Certains enfants disent préférer l'ordinateur au professeur.

- Depuis 1978, nous avons plus de micro-ordinateurs disponibles et des programmes sur un ensemble de matières, autres que l'anglais et les mathématiques, qui sont utilisés dans les écoles.

II Programme de maîtrise à l'école d'éducation

(Master of Arts degree in Interactive Educational Technology)

Les objectifs de la maîtrise sont de rendre les étudiants capables:

1. d'analyser un problème éducationnel;

2. de planifier des programmes de base sur ordinateur pour résoudre les problèmes éducationnels donnés, pour desservir des buts éducationnels;

3. de développer des logiciels (software) correspondant aux plans et spécifications donnés (langage PASCAL);

4. de faire la configuration et d'opérer des vérifications d'un programme sur ordinateur dans le sens de démontrer ses capacités et d'en définir précisément les limites.

Le programme de maîtrise se fait sur trois années, il comprend un minimum de 36 unités de cours dont 3 en résidence. Il comprend des cours en psychologie, en mathématiques, en programmation, en structure et fonctionnement de l'ordinateur, en système de programmation, en intelligence artificielle (option).

Nous recevons environ 20 étudiants par année, 45 ont déjà terminé leur maîtrise.

Les étudiants préparent des projets d'application dont un exemple nous est donné:

- ce projet traite de la lecture d'une carte
- de problèmes à résoudre
- de l'utilisation de l'information donnée pour faire des déductions.

80% des projets sont adaptés ou prévus pour le primaire-secondaire et 20% pour d'autres niveaux. Ce projet de didacticiel (qui nous a été présenté) pourra servir de base à la création de d'autres didacticiels qui pourraient être plus près de la réalité.

La plupart des disquettes sont fabriquées pour être utilisées à la maison car c'est là qu'on retrouve la majorité des ordinateurs.

Ça prend environ 250 heures de travail pour constituer une disquette de ce genre.

Nous avons une grande préoccupation pour l'interactivité des choses, ainsi que pour l'aspect graphique car nous le jugeons important.

Nous utilisons le langage PASCAL; c'est un langage logique, structuré mais il prend beaucoup de place dans la mémoire. Trois composantes importantes nous guident dans notre programme:

- le jeu
  il y a plus d'ordinateurs à la maison qu'à l'école
  présence d'éléments compétitifs pour susciter l'intérêt des enfants;

- importance de l'image par rapport au texte
  importance du langage PASCAL;

- les didacticiels aux Etats-Unis sont faits d'abord pour être utilisés à la maison, ce qui en détermine le contenu.

Une période de questions a suivi:

Sur LOGO (Super Pilot):

- plus rapide pour faire
  plus lent à l'exécution
  apprend à structurer;
- c'est toujours un langage de programmation, les expériences nous démontrent que l'on doit dépasser un certain niveau d'utilisation - d'expérience pour atteindre vraiment le niveau de créativité;
- Il y a de l'intérêt à utiliser ce langage mais n'est pas convaincu quant à l'approche;

Sur PASCAL:

- permet le travail en équipe et le travail de routine;
- c'est le langage privilégié, étant celui utilisé à l'Université;
- BASIC est aussi un bon langage, mais il y a trop de versions différentes de BASIC, ça pose des problèmes.

J'accorde beaucoup d'importance à l'intelligence artificielle, nous devons creuser cet aspect. Ça prend au moins 800K pour travailler avec l'intelligence artificielle.

Sur le graphisme:

Il faut que le graphisme prenne la place du texte.

Sur l'aspect ludique:

Beaucoup de gens pensent que ça augmente la motivation, je ne suis pas du tout d'accord.

J'accorde beaucoup d'importance à l'interactivité: vidéo-interactifs, jumelage avec des vidéo-interactifs, etc... ça permet de se rapprocher de la réalité.

III Programme de recherche

1. Analyse de la situation des choses;
   pas d'applications pédagogiques de l'ordinateur;
   plus utilisé pour la programmation;
   moins utilisé qu'il ne le pensait pour autre chose.

2. Evaluation de l'impact réel des "thinking drills".

3. Difficultés d'intégrer l'ordinateur à l'école.

Nous avions la collaboration de 12 écoles environ. Nous voulions trouver ce qui avait été fait et dégager ce qui avait été le plus fait et le moins fait. Nous avons découvert que les micro-ordinateurs étaient peu utilisés dans les écoles:

1 école ⟶ 0
1 école ⟶ 45

1/3 du temps utilisé à la programmation
1/3 du temps utilisé au "drill and practice"
et cela dans différentes matières.

Il y a un manque d'appareils en quantité suffisante. Les élèves n'ont pas d'animosité à utiliser l'ordinateur. En général, les garçons sont plus intéressés à l'ordinateur que les filles. Garçons et filles sont aussi habiles les uns que les autres à utiliser l'ordinateur. Nous avons été dans l'impossibilité de vérifier si les enfants apprennent vraiment mieux avec l'ordinateur. Les élèves pensent que l'ordinateur est mieux placé pour comprendre leurs questions et leurs problèmes. Plusieurs personnes pensent que l'ordinateur est un excellent moyen d'innover en éducation.

Nous avons trouvé et trouvons encore toutes sortes de moyens pour trouver de l'argent, et ce, malgré les coupures de budget, pour acheter des micro-ordinateurs dans les écoles.

Nous étudions également l'impact sur les élèves, les enseignantes et les enseignants, sur les apprentissages, la pensée, etc... Nous sommes très curieux au sujet de l'apport que peut faire le micro-ordinateur dans une classe.

Les machines (appareils) ne sont pas très populaires auprès des enseignantes et des enseignants étant donné qu'elles ne donnent pas souvent satisfaction. C'est impossible, croyons-nous, d'enseigner tout par ordinateur, en termes de programmes à couvrir, de temps utilisable, ainsi que du coût de fabrication du didacticiel surtout.

Nous faisons également une recherche auprès des enfants qui réussissent très bien avec l'ordinateur comme moyen d'apprentissage, à savoir qu'est-ce qui les motive? Quel est leur processus d'apprentissage? Question: Saurez-vous, suite à votre recherche, s'il y a des différences entre les élèves avec et sans ordinateur au niveau du développement de l'intelligence et des aptitudes à apprendre? Notre recherche n'est pas structurée en fonction de trouver réponse à cette question, ce serait une recherche qui aurait un coût excessif.

Nous sommes une équipe qui travaillons ensemble: 4 professeurs d'université, 5 étudiants Ph.D. C'est une fondation privée qui nous supporte dans notre recherche actuellement sur le plan financier.

L'apprentissage par ordinateur est un processus qui part de la base, du milieu, c'est un mouvement sérieux. Nous notons quand même que la pénétration de l'ordinateur à l'école est minime, qu'on utilise surtout le "drill and practice", que l'utilisation en est plus grande auprès des enfants en difficulté. Ce sont les parents, les enseignantes et les enseignants, les écoles qui accentueront ou non l'impact de l'ordinateur auprès des élèves selon qu'ils y croient plus ou moins.

Nous avons l'intention d'entreprendre une nouvelle recherche en juin sur l'enseignement de l'informatique auprès des élèves, des enseignantes et des enseignants.

IV Programme d'apprentissage des enseignantes et enseignants durant l'été

Il y a deux ans, nous avons vécu une expérience d'apprentissage avec des élèves de 12-13-14 ans qui consiste à placer les élèves deux par deux pour travailler et apprendre avec l'ordinateur. Par la suite, ces élèves doivent servir de tuteur à deux autres élèves pour leur enseigner, leur montrer ce qu'ils ont appris.

A partir de cette expérience avec les enfants, l'an dernier nous avons organisé le même programme pour les enseignantes et les enseignants en utilisant des élèves comme tuteurs. C'était un programme de 5 semaines avec, l'avant-midi, du travail sur l'ordinateur et l'après-midi, des lectures, ainsi la pratique et la théorie étaient étroitement associées.

A la fin de la session, nous avons fait passer un test et la très grande majorité l'ont réussi avec succès. Notre objectif était d'introduire les enseignantes et les enseignants à l'utilisation de l'ordinateur et à la programmation. Nous avons l'intention, cet été, d'offrir un cours plus avancé sur la programmation et l'utilisation de l'ordinateur en classe.

Questions: Quel est l'avenir de l'ordinateur dans les écoles? Je dirais, quel est l'avenir de l'éducation, de l'école? La place de l'ordinateur à l'école dépend de la philosophie qu'on a de l'école et de la classe. Quelles sont les véritables possibilités de socialisation, de coopération à l'école? Toutes les questions sont là.

Combien de micro-ordinateurs faut-il dans une école? Nous pensons que pour une école de 300 élèves, ça prend environ 15 micro-ordinateurs et ce, avec une utilisation constante et maximale.

COMMENTAIRES

Les recherches ne semblent pas concluantes sur l'impact de l'ordinateur à l'école et sur l'apprentissage. Cependant, on semble avoir une meilleure évaluation des attitudes et des intérêts.

L'intégration et l'implantation nécessiteraient un changement de l'école et une interaction plus grande entre la maison, l'école et la société. C'est un processus lent, on peut y voir un travail pour encore 10 ans environ.

Il semble qu'il n'y ait pas encore assez d'ordinateurs disponibles dans les écoles.

Pour la première fois, on se retrouve devant un outil qu'on utilise à l'école, qu'on évalue à l'école, mais avec le fait que l'on doive tenir compte que beaucoup de choses concernant l'ordinateur se passent à la maison.

QUESTIONNEMENT

- Est-ce que l'ordinateur est un instrument de clivage social entre les riches et les pauvres?
- Quelle est l'importance que l'on doit accorder au support familial?
- Quelle est l'importance du jeu dans le renforcement à l'apprentissage?
- Quelle est la place de l'évaluation, des contrôles?
- Est-ce que le traitement de textes pourrait remplacer l'ensemble des logiciels et didacticiels?
- Quelles sont les contraintes économiques?

DOCUMENTATION A L'ANNEXE XIV

- Reflections on the Educational Potential and Limitations of Microcomputers.

4.4 SAN JOSE STATE UNIVERSITY
SCHOOL OF EDUCATION
INSTRUCTIONAL TECHNOLOGY DEPARTMENT

Denny Auchard, doyen
Jim Cabaceiras, Barbara Lapossa, Elaine Anderson, Harold Hailer,
Ronald Mc Beath et 3 autres professeurs

San Jose, California

PRESENTATION

1. Présentation de Jim Cabaceiras: "Computer Courses for Teacher Candidates"

Pour Jim Cabaceiras, il faut offrir aux enseignants des cours qui leur permettent d'aborder le micro-ordinateur sans être mathématicien. Un premier cours porte sur le fonctionnement de l'ordinateur et inclut une production en langage BASIC. Dans cette première démarche, même les erreurs sont susceptibles de faire progresser l'apprentissage.

Le "Computer Literacy" de Jim Cabaceiras inclut également des cours pour les utilisateurs de logiciels. Parmi les qualités les plus importantes des logiciels actuellement disponibles, il y a celle qui permet une adaptation en fonction des besoins particuliers de l'utilisateur. Ce type de logiciel appelé "authoring" permet, par exemple, à un enseignant de mettre différents contenus dans un programme-contenant (shell program). On pourrait considérer, par exemple, qu'un programme "Crossword Magic" (disponible sur Apple) appartient à cette catégorie.

Malgré l'existence de logiciels de type "authoring", il ne se produit pas un miracle du fait d'avoir des micro-ordinateurs dans une école. Pour que l'opération réussisse, il faut que l'enseignant fasse un choix de logiciels qui tienne compte des élèves et de leur façon de réagir en faisant tourner ces logiciels. Seul l'enseignant est à même d'observer ses élèves et de faire des choix judicieux en matière de logiciels. L'enseignant est à même de faire de tels choix.

Il faut que l'utilisation d'un logiciel ajoute vraiment quelque chose de plus, quelque chose qui exploite les qualités particulières de l'ordinateur. Ce n'est pas suffisant qu'un programme se contente d'afficher des lignes de texte, comme s'il tournait des pages.

En fonction des différentes utilisations de l'ordinateur en classe, on peut distinguer le C.A.I., le C.B.I. et C.M.I. Avec le C.A.I. (Computer Assisted Instruction) ou C.A.L. (Computer Assisted Learning), c'est l'enseignant qui fournit le contenu et l'ordinateur intervient après comme support à l'apprentissage. Dans le cas du C.B.I. (Computer Based Instruction), l'ordinateur fournit d'abord l'information et l'enseignant vient ensuite appuyer cet apprentissage. Le C.M.I. (Computer Managed Instruction) assure la gestion des apprentissages. On pourrait également parler de C.M.L. (Computer Managed Learning) quand c'est l'étudiant lui-même qui gère son apprentissage.

2. Présentation de Elaine Anderson: "The IBM Project"

L'article intitulé (I.T. selected to participate in IBM model Program" du SJSU School of Education News fournit une bonne description du projet. Chaque école participante s'est engagée à fournir un coordonnateur et à libérer certains enseignants désireux de s'impliquer dans le projet, en particulier pendant les périodes de formation.

La communication nécessaire au bon fonctionnement du programme est assurée par un Newsletter et grâce à des réunions périodiques. Depuis le début des opérations (septembre 1983), les gestionnaires se sont réunis à trois reprises et les enseignants en ont fait autant.

Mme Anderson a énuméré certaines conditions nécessaires ou utiles au bon fonctionnement du programme:

a) une organisation bien articulée mais avec une structure souple (le moins d'intermédiaire possible);

b) des stimulants d'ordre monétaire pour les enseignants afin de compenser les surcharges de travail et d'augmenter la motivation;

c) des substituts aux enseignants pour les remplacer pendant les réunions et les périodes de formation;

d) l'utilisation créatrice de l'ordinateur pour assurer une véritable intégration aux différentes matières.

Les 8$ millions investis par IBM dans le programme "IBM Model Secondary School Computer Education" ne comportaient aucune condition si ce n'est que les matières impliquées soient autres que les mathématiques et les sciences.

3. Présentation de certains cours particuliers

On retrouvera en annexe le "greensheet" (syllabus condensé) de certains cours du programme de maîtrise en technologie éducative. L'un de ces cours porte sur le "self pace instruction" et a comme fondement les théories de Skinner relatives à l'enseignement programmé. Il vise à apporter une aide aux enseignants qui ont souvent de la difficulté à morceler l'enseignement et à prévoir, à différentes étapes, des renforçateurs pour les étudiants. Selon le professeur Ronald Mc Beath, plusieurs enseignants ne font pas la différence entre curriculum et matière, i.e. entre les contenus de cours et les stratégies ou relations entre ces contenus.

Il est donc important que les enseignants apprennent à organiser l'information, à élaborer des designs pédagogiques en partant de l'enfant.

L'évolution nous conduit à un transfert des responsabilités de l'apprentissage vers l'apprenant. Le tandem psychologues-informaticiens permet un retour aux sources, i.e. partir de la psychologie de l'enfant et sortir l'informatique des mains des mathématiciens et des scientifiques.

DOCUMENTATION A L'ANNEXE XV

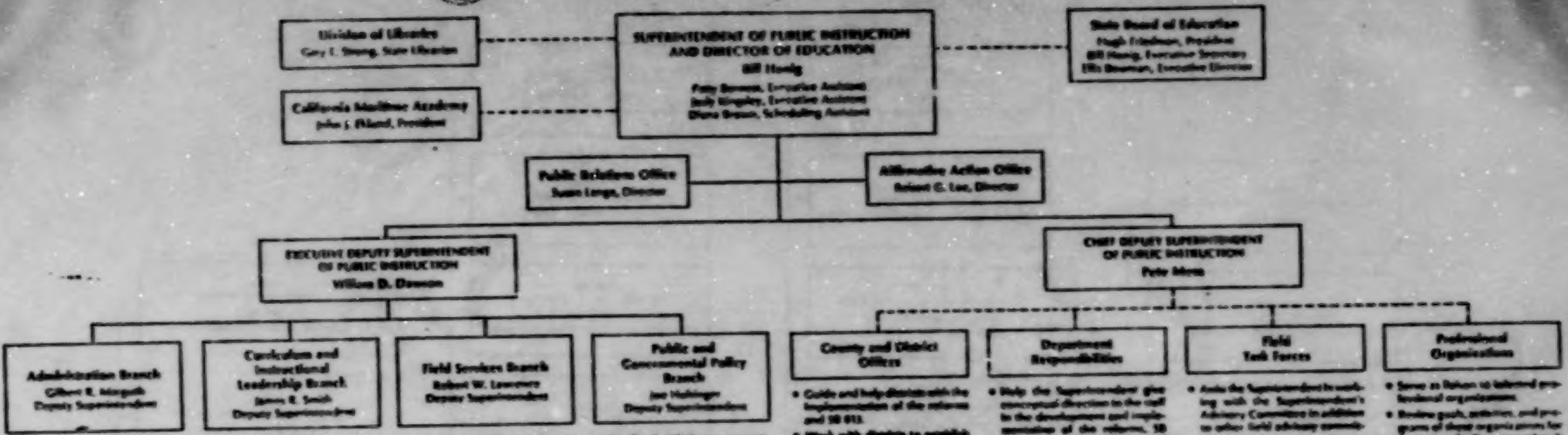
- San Jose State University - School of Education - Instructional Technology Department: Instructional Technology Graduate Degree Program (Course Offerings, Sequence and Descriptions)
- San Jose State University - School of Education NEWS: It Selected to Participate in IBM Model Program.

ANNEXES

ANNEXE 1

Documentation sur le Département
de l'Education de la
Californie: Rôle et organisation

California State Department of Education


Division of Libraries
Gary E. Strong, State Librarian
California Maritime Academy
John J. Ekland, President
SUPERINTENDENT OF PUBLIC INSTRUCTION AND DIRECTOR OF EDUCATION
Bill Honig
Patty Bowman, Executive Assistant
Judy Kingsley, Executive Assistant
Diane Brown, Scheduling Assistant
State Board of Education
Hugh Friedman, President
Bill Honig, Executive Secretary
Ellis Bowman, Executive Director
Public Relations Office
Susan Lange, Director
Affirmative Action Office
Robert G. Lee, Director
EXECUTIVE DEPUTY SUPERINTENDENT OF PUBLIC INSTRUCTION
William D. Dawson
CHIEF DEPUTY SUPERINTENDENT OF PUBLIC INSTRUCTION
Pete Mehas
Administration Branch
Gilbert R. Margath
Deputy Superintendent
Curriculum and Instructional Leadership Branch
James R. Smith
Deputy Superintendent
Field Services Branch
Robert W. Lawrence
Deputy Superintendent
Public and Governmental Policy Branch
Joe Holsinger
Deputy Superintendent
County and District Offices
Department Responsibilities
Field Task Forces
Professional Organizations

Administration Branch

- Provide personnel services.
- Facilitate staff training and management development, and implement employee and management evaluation systems.
- Provide plant and physical services.
- Issue and monitor contracts.
- Apportion funds to all levels of LEAs in conformance with regulations, policies, and statutes (both state and federal).
- Perform cost accounting, maintain expenditure controls, and provide fiscal information for internal and external purposes.
- Provide budgeting services.
- Provide training and support for word processing and EDP equipment users.
- Provide software support for Departmental units requiring data management for processing.
- Establish and maintain data bases for reporting mandated and policy-directed information.
- Provide publications and media services.

Curriculum and Instructional Leadership Branch

- Develop curriculum guidelines and handbooks for LEAs.
- Provide technical assistance to help LEAs understand and implement statutes, regulations, and guidelines.
- Operate six special schools for handicapped youth.
- Administer major statewide testing programs.
- Administer/award federal grants to LEAs.
- Conduct research, evaluations, and special studies on state and federal programs for the Department, the Legislature, and the federal government.
- Coordinate staff development programs for teachers.
- Provide direct services to youth organizations.
- Assist LEAs to link with State and Federal Employment Training Program.
- Provide categorical program support.
- Ensure that special needs students receive service consistent with their needs and abilities.

Field Services Branch

- Administer child development contracts with public and private organizations.
- Provide programs that promote children's healthy development, support low income families, and prevent child abuse and neglect.
- Acquire and distribute commodities donated by the federal government.
- Assist school districts and nonprofit agencies in providing nutritious meals to children.
- Provide assistance and training to LEAs in their organization, management, administration, and operations.
- Ensure that LEAs operate in compliance with categorical program laws, and streamline the administration of those laws.
- Coordinate the Departmental audit responsibilities.
- Authorize the operation of private postsecondary educational institutions and approve/disapprove institutions for veterans' training.
- Ensure consumer protection for students and regulation of private postsecondary educational institutions.

Public and Governmental Policy Branch

- Develop legislation to promote Departmental goals.
- Determine position of Department on legislation pertaining to public education.
- Represent Departmental goals and positions on legislation with individual members of the Legislature and testify before legislative committees.
- Maintain contact with various interest groups regarding legislative matters.
- Represent Department on federal legislation and maintain Congressional liaison.
- Provide legal research for Department and advise state Superintendent on legal issues.
- Initiate and maintain contact with public interest groups concerning Department's goals and programs.

County and District Offices

- Guide and help districts with the implementation of the reforms and SB 813.
- Work with districts to establish models of the reform implementation.

Department Responsibilities

- Help the Superintendent give conceptual direction to the staff in the development and implementation of the reforms, SB 813, and other services and products going to the field.
- Review and evaluate Departmental products and services that go to the field.
- Help the Superintendent to set priorities, policies, guidelines, and so forth for the Department and the field.
- Interpret the Superintendent's goals into broad strategies, major tasks, and plans for implementation.
- Carry out special tasks assigned by the Superintendent.
- Participate with the Superintendent and Executive Deputy in decisions affecting the Department and field issues.

Field Task Forces

- Assist the Superintendent in working with the Superintendent's Advisory Committee in addition to other field advisory committees.
- Establish special Department task forces to carry out tasks related to implementation of SB 813 and the reforms.
- Establish and direct field task forces assigned by the Superintendent.

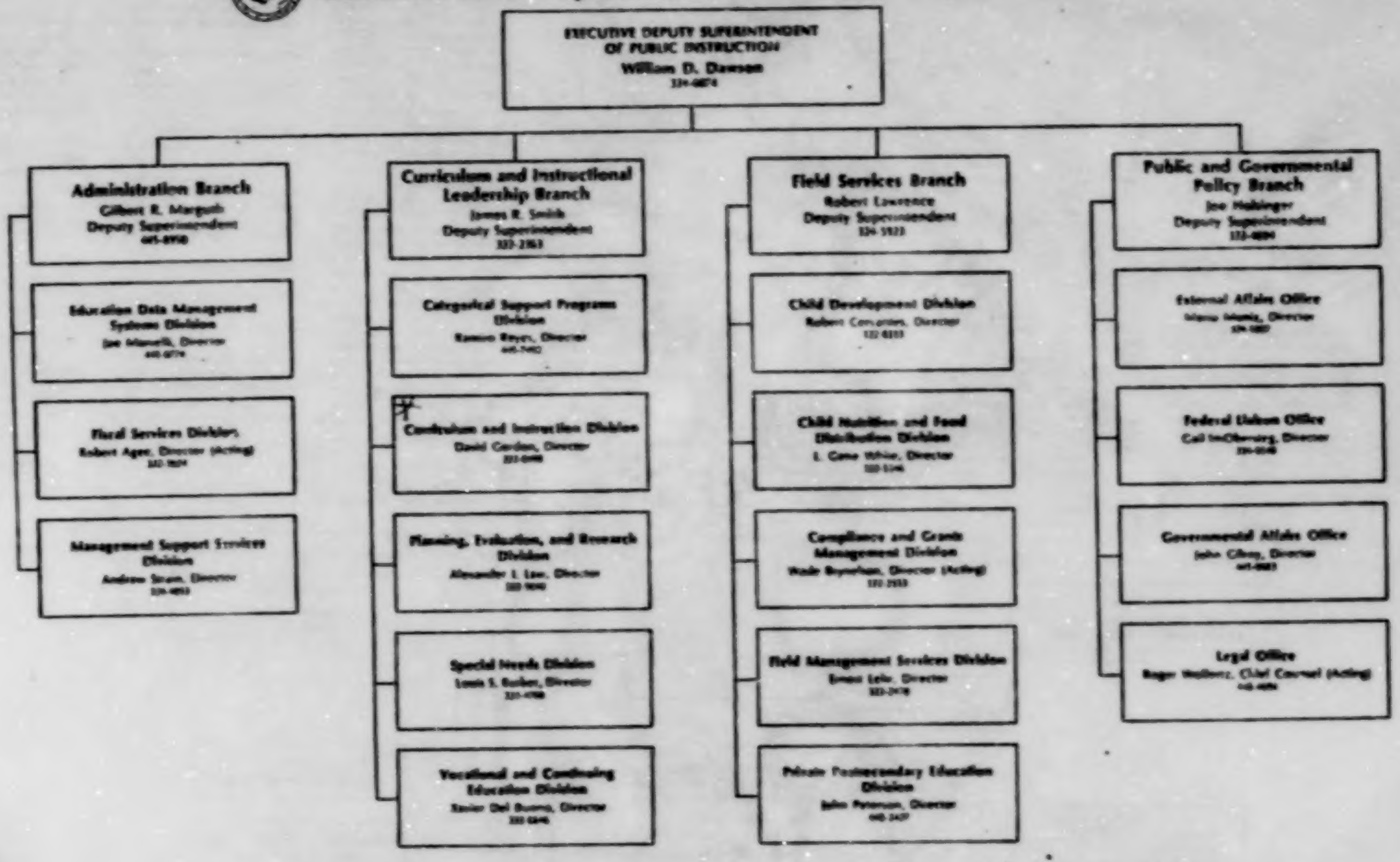
Professional Organizations

- Serve as liaison to selected professional organizations.
- Review goals, activities, and programs of these organizations for implications for Departmental goals and activities.
- Establish coalitions with these organizations to promote Departmental goals.

Approved Bill Honig Date February 6, 1984

Bill Honig, Superintendent of Public Instruction

California State Department of Education—Operations



EXECUTIVE DEPUTY SUPERINTENDENT OF PUBLIC INSTRUCTION
William D. Dawson
[illegible]

Administration Branch
Gilbert R. Margath
Deputy Superintendent
[illegible]

- Education Data Management Systems Division
  Joe Manoelli, Director
  [illegible]
- Fiscal Services Division
  Robert Agee, Director (Acting)
  [illegible]
- Management Support Services Division
  Andrew Stram, Director
  [illegible]

Curriculum and Instructional Leadership Branch
James R. Smith
Deputy Superintendent
322-2363

- Categorical Support Programs Division
  Ramiro Reyes, Director
  [illegible]
- Curriculum and Instruction Division
  David Gordon, Director
  [illegible]
- Planning, Evaluation, and Research Division
  Alexander I. Law, Director
  [illegible]
- Special Needs Division
  Louis S. Barber, Director
  [illegible]
- Vocational and Continuing Education Division
  Xavier Del Buono, Director
  [illegible]

Field Services Branch
Robert Lawrence
Deputy Superintendent
324-5923

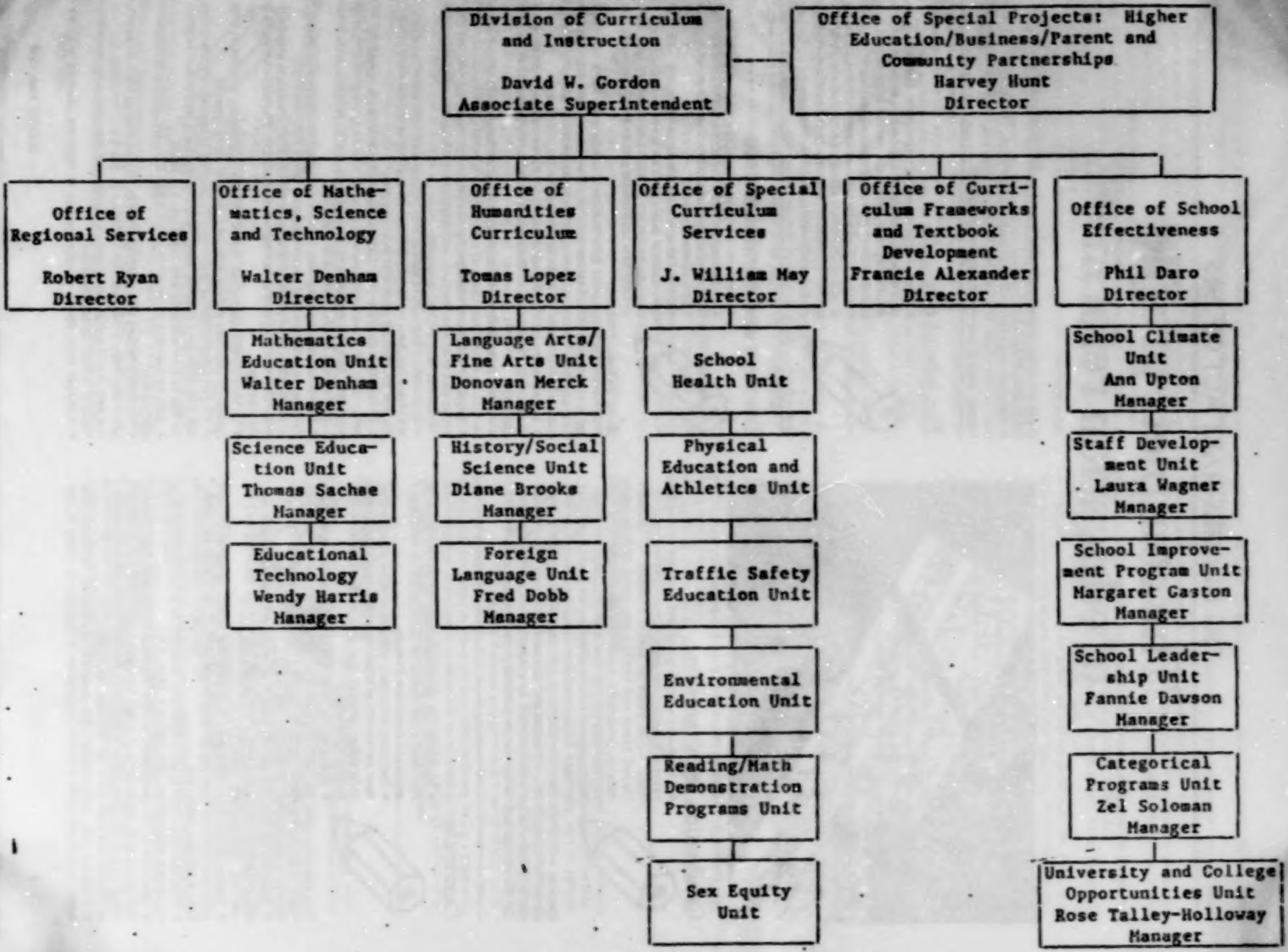
- Child Development Division
  Robert Cervantes, Director
  322-6233
- Child Nutrition and Food Distribution Division
  L. Gene White, Director
  [illegible]
- Compliance and Grants Management Division
  Wade Brynelson, Director (Acting)
  322-2533
- Field Management Services Division
  Ernest Lehr, Director
  323-2478
- Private Postsecondary Education Division
  John Peterson, Director
  445-3427

Public and Governmental Policy Branch
Joe Holsinger
Deputy Superintendent
[illegible]

- External Affairs Office
  Maria Muniz, Director
  [illegible]
- Federal Liaison Office
  Gail ImObersteg, Director
  [illegible]
- Governmental Affairs Office
  John Gilroy, Director
  [illegible]
- Legal Office
  Roger Wolfertz, Chief Counsel (Acting)
  [illegible]

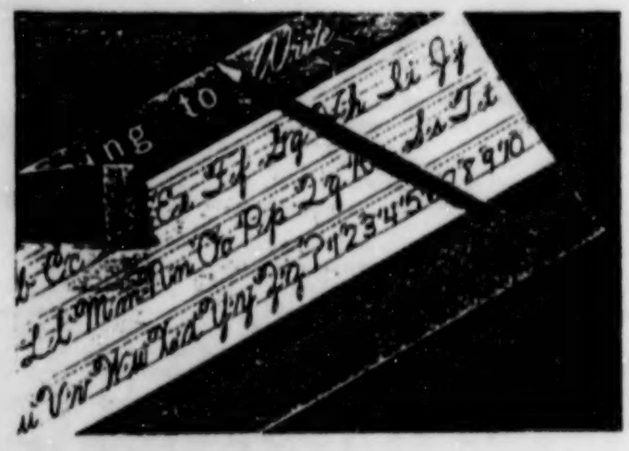
Approved Bill Honig

Date February 6, 1984


Division of Curriculum and Instruction
David W. Gordon
Associate Superintendent
Office of Special Projects: Higher Education/Business/Parent and Community Partnerships
Harvey Hunt
Director
Office of Regional Services
Robert Ryan
Director
Office of Mathematics, Science and Technology
Walter Denham
Director
Mathematics Education Unit
Walter Denham
Manager
Science Education Unit
Thomas Sachse
Manager
Educational Technology
Wendy Harris
Manager
Office of Humanities Curriculum
Tomas Lopez
Director
Language Arts/Fine Arts Unit
Donovan Merck
Manager
History/Social Science Unit
Diane Brooks
Manager
Foreign Language Unit
Fred Dobb
Manager
Office of Special Curriculum Services
J. William May
Director
School Health Unit
Physical Education and Athletics Unit
Traffic Safety Education Unit
Environmental Education Unit
Reading/Math Demonstration Programs Unit
Sex Equity Unit
Office of Curriculum Frameworks and Textbook Development
Francie Alexander
Director
Office of School Effectiveness
Phil Daro
Director
School Climate Unit
Ann Upton
Manager
Staff Development Unit
Laura Wagner
Manager
School Improvement Program Unit
Margaret Gaston
Manager
School Leadership Unit
Fannie Dawson
Manager
Categorical Programs Unit
Zel Soloman
Manager
University and College Opportunities Unit
Rose Talley-Holloway
Manager

THE HUGHES-HART ACT OF 1983

The complete profile of education reform



Graduation requirements

- Mandates that all high school students have three years of English; two years of math; two years of science; three years of social science, to include United States and world history and culture, economics, geography, American government and civics; and one year of fine arts or foreign language. Requirements to take effect for the graduating class of 1987. Superintendent of public instruction will develop a model curricular program and specific competency standards for students in each mandated course. (Although many school districts have taken the initiative to strengthen local requirements, California has had no statewide graduation requirements since 1969.)

Curricula

- Requires the superintendent of public instruction and state Board of Education to develop a course in computer literacy.
- Requires secondary schools to offer courses that meet university admission prerequisites and to provide other courses that give students entry-level employment skills.
- Requires the state Board of Education to prepare two examinations for later inclusion in voluntarily taken "Golden State" high-achievement tests, to enable high school seniors to try for honors at graduation. ($100,000, 1983-84)
- Provides for summer school classes in math, science and other critical academic fields and sets aside funds for teacher training and retraining. ($40 million, 1984-85)
- Increases funds for textbooks in grades K-8 to $21.18 per pupil and provides first-ever funding for texts in grades 9-12, at $14.41 per pupil. ($35.9 million, 1983-84)
- Provides mini-grants up to $2,000 to teachers for projects to improve classroom instruction. ($18 million, 1984-85)
- Launches a pilot program to award financial bonuses to high schools that voluntarily participate in a new Education Improvement Incentive Program and that demonstrate improved student performance on basic-skills achievement tests. ($7 million, 1984-85)
- Expands state achievement test program in reading, language and math to include grade 8 (with declaration of legislative intent to add grade 10, other academic subjects and higher-level analytical skills) ($250,000, 1983-84)
- Requires superintendent of public instruction to report to Legislature in November 1983 on feasibility of studying the effectiveness of current high school accreditation programs.

The school day

- Gives fiscal incentives to school districts to extend school year from 175 to 180 days; lengthens school day, ensuring a six-period high school day; and prohibits any reduction of instructional time below 1982-83 levels — a response to studies indicating California students have less instructional time than national average, particularly in primary grades. ($256 million, 1984-85)

Teachers and administrators

- Requires persons obtaining a teaching credential after September 1985 to complete 150 hours of continuing education every five years in order to maintain credential.
- Establishes teacher "mentor" program — a modified form of merit pay that gives an annual stipend of up to $4,000 to outstanding teachers who agree to help new instructors and to develop curriculum. ($10.5 million, 1983-84)
- Allows high schools to hire teacher-trainees who have not taken graduate courses in education provided they have a bachelor's degree, pass basic-skills and subject-matter exams, receive assistance from a mentor and prepare an individualized training program.
- Boosts entry-level teachers' salaries by 30 percent over three years, to an annual minimum of $18,000 adjusted by inflation. ($12 million, 1983-84)
- Allows local collective bargaining for additional teacher pay based on factors other than years of service and continuing education.
- Expands teachers' continuing education for regional teacher education and computer centers, emphasizing math, science and computer education. ($5 million, 1984-85)
- Expresses a legislative intent that college and university professors who train teachers teach in public elementary or secondary schools and classrooms at least once every three years.
- Gives state Student Aid Commission administrative funds for development of a loan-forgiveness program to encourage that college students become secondary teachers in math, science and other high-demand fields. ($100,000, 1983-84)
- Provides training programs chiefly designed to improve principals' abilities to evaluate and assist teachers. ($500,000, 1984-85)
- Establishes pilot projects in county offices of education to assist districts in recruiting and selecting administrators. (Funded through the state budget)
- Gives districts discretion, based on local standards, to dismiss probationary teachers during first two years of employment.
- Allows school boards to disregard seniority in teacher layoffs if they can demonstrate a specific need for a course that a less-senior instructor has special training and experience to teach.
- Allows districts to lay off teachers when changes in state law modify curriculum.
- Permits districts to lay off teachers as late as August 15th if they receive less than a two percent increase in per-pupil revenue. Current law sets layoff notice deadlines in March and May and does not allow "lack of funds" as justification.
- Reduces from 90- to 45-days notice to teachers charged with un-

professional conduct and deletes the requirement for prior-semester notice to teachers charged with unprofessional conduct or incompetence.

- Limits defendant-employee's evidentiary discovery period to 30 days after employee is notified of accusations, and provides that nonsubstantive procedural errors will not reverse decisions in teacher layoffs or dismissals.
- Allows local boards to seek intermediate sanction, such as suspension without pay, for permanent or probationary teachers at hearing of local three-member commissions on professional competence.
- Reduces notice for dismissal or reassignment of district-level administrators from six months to 45 days.
- Allows districts to require continuing education for teachers who receive negative evaluations.
- Permits districts to pay laid-off teachers used as substitutes at substitute rate if they teach less than 20 days in any given 60 day period; after 20 days, pay returns to what teachers would normally receive if reappointed to full-time employment.
- Requires subject-matter competency tests for all teachers and administrators reassigned to teaching if they do not have credential or college major in the appropriate subject.
- Prohibits administrators from accumulating seniority as teachers, with exception that principals may acquire up to three years' worth.
- Exempts from permanent status non-certified employees designated senior managers.
- Requires local boards by December 1984 to establish policies to certify administrator competence to evaluate teachers, meet needs of new teachers for training and handle parent complaints.
- Authorizes districts to establish innovative local experiments to streamline personnel and management practices, improve district efficiency and give incentives for service in high-demand subject areas or geographic areas. (Marginal costs, to be funded from state budget)

New school programs

- Creates the California Academic Partnership Program to be administered by California State University and provides grants to colleges and universities that assist junior and senior high schools with counseling, tutoring and curriculum development. ($1 million, 1984-85)
- Develops specialized high schools in high technology and performing arts to provide models for other schools throughout state. ($2 million, 1984-85)
- Strengthens academic and career counseling and requires that all 10th grade students receive a review of their school records and an appraisal of educational options. ($6 million, 1983-84)
- Requires continuation high schools to keep drop-out records and to offer job-orientation programs as well as academic classes.
- Increases "opportunity" classes and schools for problem students in grades 7 to 9. ($4 million, 1984-85)
- Requires regional occupational programs and centers to provide additional funding for youth job training.
- Requires review of apprenticeship programs by the superintendent of public instruction and community colleges' chancellor and makes several changes in the funding of these programs.
- Requires superintendent of public instruction to develop a study of characteristics of students who drop out of school before graduating from high school.

Special programs

- Expands local district authority to use categorical aid for educationally disadvantaged children on a school-wide basis.
- Requires that 85 percent of categorial funds go to direct services for students.
- Simplifies and equalizes funding for the state School Improvement Program and allows the superintendent of public instruction to waive planning requirements. ($10 million, 1984-85)
- Requires maintenance of state economic-impact aid funding to disadvantaged secondary schools and allows waivers of education code laws or regulations in order to improve pupil services in schools receiving funds.
- Allows high school districts and feeder elementary schools to be considered "unified" to qualify for state urban-impact aid. ($9 million, 1984-85)
- Provides a cost-of-living increase of eight percent for special education programs for handicapped children. (Included in a $92.5 million appropriation for categorical programs, 1983-84)
- Revises and clarifies formula for funding adult education programs and provides a six percent cost-of-living increase. ($7.6 million, 1983-84)
- Consolidates regular and special education transportation programs and speeds up state reimbursement to districts. (1984-85)
- Provides funding for replacement of unsafe school buses for small rural school districts. ($1 million, 1983-84)
- Postpones sunset date for adult education until June 30, 1986, and extends indefinitely sunset dates for driver training, environmental education, career guidance centers and transportation.
- Provides state funds for equipment and capital outlay for agricultural vocational education programs. ($3 million, 1983-84)

Discipline

- Provides mandatory expulsion or suspension of students for serious violations such as weapons possession, drug sales and robbery, and increases the number of administrators who may suspend them.
- Prohibits students suspended from one class from placement in another and requires supervision by appropriate school employees when suspended students remain on school grounds.
- Gives teachers authority to require suspended students to make up work and requires districts to adopt policies so that teachers may fail students for excessive absences.
- Permits use of written testimony at expulsion hearings when witnesses fear harm.
- Requires notification to parents of truant students that parents may be in violation of law.
- Requires districts to adopt policies on student promotion and retention.

State-local issues

- Requires the superintendent of public instruction to review all state program guidelines for clarity, necessity and legal authority, and to inform districts that guidelines are not mandates.
- Creates a temporary state Commission on School Governance and Management to study duplication between regional and state agencies, optimal size of school districts and growth in number of non-teaching employees and to report to the Legislature before October 1, 1984.
- Includes language to place on June 1984 primary ballot a proposed constitutional amendment to establish an education trust fund to provide stability for school financial planning. (ACA 44 authored by Republican Assemblyman Robert Naylor of San Carlos)

School facilities

- Provides fiscal incentives to encourage year-round use of schools to save state capital outlay costs. ($7.5 million, 1984-85)
- Provides that districts applying for state school construction money be required to develop a five-year plan for facility needs; requires districts with vacant schools to make first offer of use of schools to adjacent districts that are overcrowded; and permits inter-governmental agreements for joint use of facilities.
- Reduces some matching-fund requirements for districts when portable buildings are purchased.
- Provides for continued appropriation of state School Deferred Maintenance Fund.
- Allows districts to use lease proceeds from surplus property for routine repair of buildings.
- Requires state Department of Education to study the feasibility of an automated-facility inventory and architectural-design standards and materials for school facilities.

ANNEXE II

Documentation sur le Département
de l'Education de la Californie:
La décentralisation et l'implantation
des ordinateurs

(Document 1)

OVERVIEW OF THE TEACHER EDUCATION AND COMPUTER CENTER (TECC) PROGRAM

A. Program Description

Fifteen Teacher Education and Computer Centers, established in the 1982-83 Budget Act and codified in SB 813/1983, are charged with providing staff development services to teachers and administrators on a regional basis. Using the model of former teacher service agencies (School Resource Centers [SRCs] and Professional Development and Program Improvement Centers [PDPICs]), the TECCs provide staff development services in math, science, technology, and other curricular/instructional areas.

The TECCs are located to reflect the general attendance areas of the California State University campuses, which results in a geographically diverse network spanning county lines. County superintendents in each designated TECC region select one of their county offices as the Local Education Agency to house the TECC operations. In regions where there are multiple county offices, the superintendents have the option of establishing an executive board.

TECCs are governed by policy boards, composed of a majority of teachers. These boards work with TECC staff to set service priorities and coordinate with the LEA to oversee TECC functions. Functions include providing services in:

- Teaching methodology and instructional improvement training
- Technical assistance to support school-based staff development programs
- Instructional use of computers

In addition, TECCs are charged with accessing resources from business and industry and establishing cooperative relationships with institutions of higher education (IHEs).

B. Program Services

(1) THE TEACHING METHODOLOGY AND INSTRUCTIONAL IMPROVEMENT FUNCTION is a major carry-over service from prior PDPIC and SRC activities. Research on instructional strategies associated with improved student achievement is used to design long-term, systematic training for teachers and administrators. These trainings include:

- Activities to promote the principal's ability to support instructional improvement and the teacher's ability to diagnose learning needs
- The development of program content

- The use of multiple instructional approaches

- The use of student assessment data

The training of trainers concept is central to the TECC's delivery of instructional methodology. Selected trainers receive additional training in clinical supervision in order to become trainers themselves and act as classroom "coaches" for their peers.

(2) ASSISTANCE FOR SITE-BASED STAFF DEVELOPMENT PROGRAMS

(a) Local Staff Development Programs, Article 1

TECCs provide oversight and general management of local school staff development programs (AB 551). TEC Center staff are responsible for the award and oversight of grants to schools within their region. Technical assistance to promote local programs includes, but is not limited to, the following activities:

- Assessing school needs
- Developing site plans
- Training school personnel
- Brokering services and resources to local providers other than the TECC
- Evaluating local programs

(b) Assistance to Other Site-Based Staff Development Programs

Technical assistance is also provided for other site-based staff development programs, including school improvement, categorical programs, and district-developed activities. A central goal of these activities is to empower local staff to provide their own training and renewal programs on an ongoing basis. This objective is pursued through direct and referral services to other agencies and consulting services to assist individual school staffs to plan, implement, and evaluate their own programs of staff development.

(3) COMPUTER DEMONSTRATION AND TRAINING was a central thrust of the authorizing TECC initiative, and continues to be a major service function. The TECCs are charged with providing computer demonstration and training sites where teachers are trained in:

- Use of computers as teaching aids

- Criteria for school acquisition and use of computer equipment and software

- The evaluation of computer-related materials

- Methods of integrating the use of computers into the routine activities of the classroom

C. Support Activities

To support TECC computer training activities, the San Mateo County Software Library and Clearinghouse was established as a support system for demonstration and training in software use, and circulation of evaluated software. TECC staffs are trained in software evaluation, establishing software evaluation training programs, and methods of integrating software into classroom instruction.

The Math Teacher Retraining project, directed by the Los Angeles TEC Center, coordinates college and university content training with TECC instructional methodology to facilitate retraining of math and science teachers.

D. Relationships with IHEs and Other Agencies

TECCs establish a relationship with colleges, universities, and the business and industry community to elicit their support in providing services and resources through the TECCs. College and university persons are represented on regional policy boards, and while much work remains to be done, some cooperative IHE/TECC training is occurring.

Similarly, representatives from the business community and, in particular, the computer industry, also serve on policy boards and co-sponsor TECC activities.

TEC Center services are in high demand and are often oversubscribed. Their service priorities are limited both by legislated mandate and policy board decisions to maintain high quality services. Thus, we need to keep reasonable expectations of what they can offer. Nevertheless, networking is a key element in creating a staff development system. If you have a request, product, or service to share, contact your regional TEC Center Director (map attached) and help build the network of quality staff development services in California.

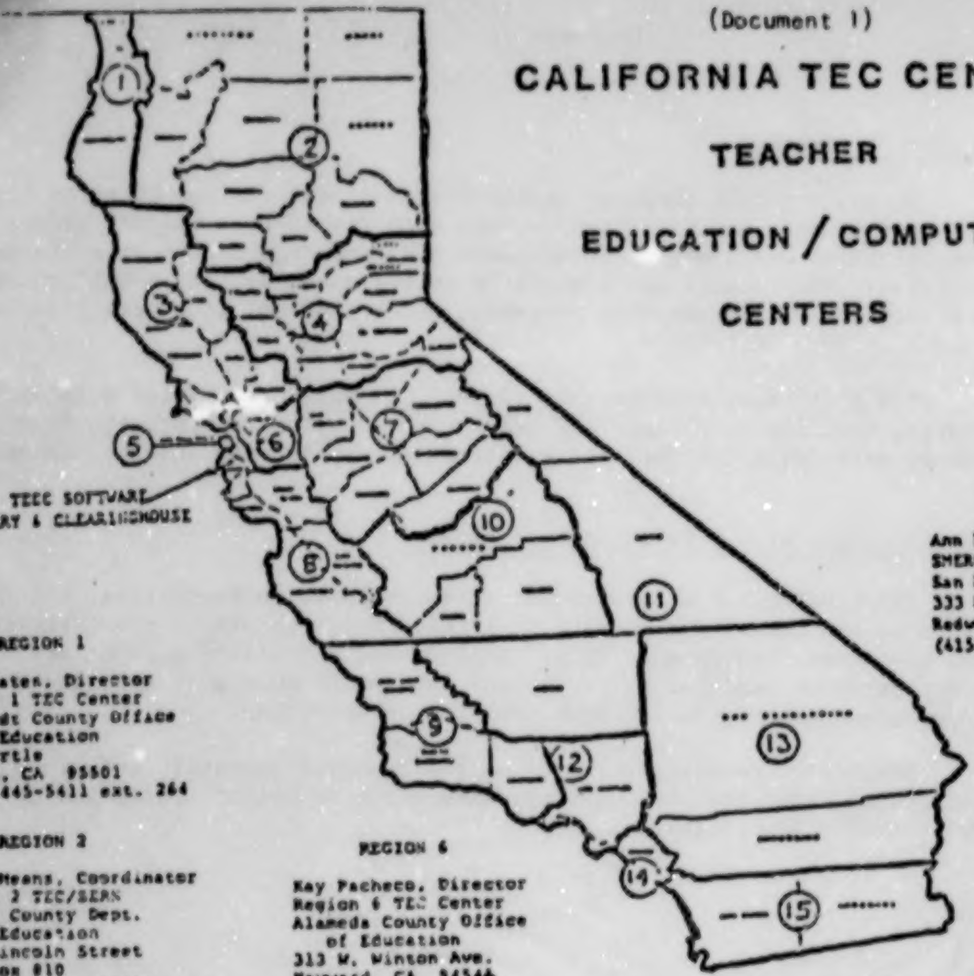
(Document 1)

CALIFORNIA TEC CENTERS

TEACHER

EDUCATION / COMPUTER

CENTERS



TECC SOFTWARE
LIBRARY & CLEARINGHOUSE

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SMERC Library & Microcomputer C
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333 Main St.
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REGION 1

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REGION 2

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REGION 4

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REGION 5

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REGION 6

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REGION 7

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Nanette Green, Co-Director
Region 7 TEC Center

REGION 8

Shareen Young, Director
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REGION 9

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REGION 12

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REGION 13

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REGION 14

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[illegible]
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REGION 15

Dr. Jack Hill, Direct
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Margie Atwood, Co-
Imperial County TEC C
Imperial County Offic
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El Centro, CA 922
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(Document 2)

CALIFORNIA STATE DEPARTMENT OF EDUCATION **Bill Honig**
721 Capitol Mall Superintendent
Sacramento, CA 95814 of Public Instruction

November 1, 1983

TO: County and District Superintendents

FROM: Bill Honig
Superintendent of Public Instruction

SUBJECT: MENTOR TEACHER PROGRAM

The California Mentor Teacher Program is an important provision in SB 813 designed to upgrade the quality of instruction. I believe that the program provides an exciting opportunity to reward excellence in teaching while implementing the reform mandate we have been given. You should view the program as an integral part of all other efforts aimed at improving the quality of instruction in the schools in your district.

The attached Program Advisory provides recommendations for program design as well as information on the availability of funding to support participation in the Mentor Teacher Program from January 1 through July 1, 1984. I urge school boards, administrators, and teachers to work together to take full advantage of the opportunities presented by the Mentor Teacher Program.

BH:biw

Attachment

(Document 2)

LL HONIG
UPERINTENDENT OF PUBLIC INSTRUCTION

CIL: 83/4-5

DATE: November 1, 1983

PROGRAM: Mentor Teacher Program

PROGRAM ADVISORY

CALIFORNIA STATE DEPARTMENT OF EDUCATION
721 CAPITOL MALL, SACRAMENTO, CA 95814

CONTACT: Dr. Laura A. Wagner
Director, OSD

PHONE: (916) 322-5588

TO: County Superintendents
District Superintendents

FROM: James R. Smith, Deputy Superintendent
Curriculum and Instructional Leadership

Introduction

The Hughes-Hart Educational Reform Act of 1983 (SB 813) initiated an array of programs which hold great promise for improving California's schools. As Superintendent Bill Honig has stated, the Legislature, Governor, the public, and educators have joined together to:

- provide significant funding increases for 1983-84 and call for important school quality reforms;
- demonstrate a renewed concern for and support of academic excellence in the public schools; and
- launch a coordinated, all-out effort to improve student performance, create an orderly learning environment in each of our schools, and provide educational leadership in our communities.

The Mentor Teacher Program offers a unique opportunity for school boards, administrators, and teachers to work together toward these goals.

This advisory has four purposes: first, to provide general background on the purposes of and opportunities presented by the Mentor Teacher Program; second, to offer suggestions to assist districts in initial planning of this program; third, to describe the Department's responsibilities and time lines for program implementation and, fourth, to request a letter of intent from districts to indicate interest in participating in the Mentor Teacher Program.

Background

The California Mentor Teacher Program (Article 4, commencing with Section 44490 of the Education Code) is intended to encourage retention of exemplary teachers and upgrading of skills of new and experienced teachers. This is to be accomplished by selecting "mentor teachers" and designating part of their time for staff development with teacher trainees,* new and experienced teachers, and work on curriculum development. In return, these exemplary teachers will receive a $4,000 annual stipend. Mentors are selected on the basis of exemplary teaching. They are not required to hold administrative or other special credentials, and they are specifically prohibited from participating in the evaluation of other teachers.

Districts are not required to participate in either the Teacher Trainee Program or the Mentor Teacher Program. Both are implemented at district discretion. Districts may choose to implement the Mentor Program and not use teacher trainees. Districts wishing to implement a teacher trainee program must certify that there is a shortage of teachers in the subject matter area in which they intend to use trainees. However, districts which decide to employ teacher trainees are required to participate in the Mentor Program.

SB-813 enacted a number of provisions which were designed to offer teachers avenues of initiative and creativity which would encourage them to remain in classroom teaching. In characterizing the intent of the Mentor Teacher Program, the Legislature stated:

> 44490. The Legislature recognizes that the classroom is the locus of teaching reward and satisfaction. However, the Legislature finds that many potentially effective teachers leave the teaching profession because it does not offer them support, assistance, recognition, and career opportunities that they need.
>
> It is the intent of the Legislature in the enactment of this article to encourage teachers currently employed in the public school system to continue to pursue excellence within their profession, to provide incentives to teachers of demonstrated ability and expertise to remain in the public school system, and to restore the teaching profession to its position of primary importance within the structure of the state educational system.

---

*The Teacher Trainee Provisions (Section 25.5, Article 7.5, Section 44325) authorize the Commission on Teacher Credentialing (CTC) to issue certificates to allow persons with baccalaureate degrees but no professional preparation in education to teach in secondary schools (grades 9-12, 7-8 if departmentalized). Teacher trainees are to have a professional development plan and be guided and trained by a mentor teacher. District models for professional development of trainees may include collaboration between the district and institutions of higher education. The CTC contact person is: Michael McKibbin, Consultant for Planning and Research, Commission on Teacher Credentialing, 1020 O Street, Room 222, Sacramento, CA 95814, (916) 445-3223.

SB 813 authorizes districts to designate up to 5 percent of their teachers as mentors. Undoubtedly, many more teachers could qualify and serve with distinction in the mentor role. Hopefully, this initial authorization for mentor teaching will be a first step in creating a variety of career ladders for classroom teachers. However, current funding levels restrict the number of mentors that can be selected.

ISSUES TO CONSIDER IN PLANNING MENTOR TEACHER PROGRAMS

The Mentor Teacher Program is a new opportunity and will require thoughtful planning in order to support educational improvement. The Department recommends that districts go through the following steps in planning a Mentor Teacher Program.

I. Planning and Program Design

1. Begin initial program planning immediately. SB 813 intends that mentor programs be initiated during the 1983-84 school year. Program regulations are not due to be adopted by the State Board of Education until January 1984. Districts should not wait until the regulations are released to begin program planning. As the rest of this advisory suggests, there are many issues that districts can consider which will not be dependent on the regulations for guidance.

2. Work with appropriate groups in planning the program. The success of a Mentor Teacher Program will depend in large measure on support and commitment from all those involved--teachers, governing boards, administrators, and other interested parties. Hence, district governing boards considering participating in the mentor program should convene these groups as soon as possible to establish a collaborative approach to program planning. One method of accomplishing this might be to establish an ad hoc committee to engage in initial discussions about local goals and design of a mentor program.

3. Consider needs and potential roles mentors should fill. Staff training activities and support are critical elements for fostering teacher and organizational change, and sustaining these changes in sufficient depth to impact student achievement. However, there is no single unitary system for providing staff development. Thus, how the mentor program is used in individual school districts will, and is expected to vary widely. District committees considering implementation of a mentor teacher program should examine how the program will relate to other initiatives requiring broad-based support from teachers and administrators (School Improvement, AB 551, Student Study Teams), and discuss alternative roles that mentors might fill. Section III of this Advisory (pages 6 - 8) outlines potential roles mentors might fill. Program planners should consider these alternatives in designing their mentor programs.

(Document 2)

II. Determining Criteria and Selection Procedures

1. Define roles of selection committee. Education Code Section 44495 states that "The selection procedures for the designation of certificated classroom teachers as mentor teachers shall, at a minimum, provide for the following:

"(a) A selection committee shall be established to nominate candidates for selection as mentor teachers. The majority of the committee shall be composed of certificated classroom teachers chosen to serve on the committee by other certificated classroom teachers. The remainder of the committee shall be composed of school administrators, chosen to serve on the committee by other school administrators. The governing board of a participating school district shall consider including parents, pupils, or other public representatives in the selection process, and may, at its option, include such persons.

"(b) Candidates for mentor teachers shall be nominated by the majority vote of the selection committee.

"(c) The selection process shall include provisions for classroom observation of candidates by administrators and classroom teachers employed by the district.

"(d) The final designation of any person as a mentor teacher shall be by action of the governing board of the school district from persons nominated pursuant to subdivision (b). The governing board may reject any nominations."

Governing boards may require any procedures for selection of committee members that are consistent with Section 44495. The final designation of mentor teachers is left to the governing board, which can also reject any nomination. The Department recommends that governing boards permit all eligible teachers to make application for mentor positions.

The role of the nominating committee for the mentors is an important one, and all participating groups will want to give careful thought to the selection of the nominating committee, the roles nominating committee members will play in assessment of mentor teacher candidates, and the type of commitment expected of nominating committee members. Another issue to consider is whether members of the nominating committee can apply to be mentor teachers. We recommend that they be allowed to do so.

Like the program as a whole, there is no single "best way" to constitute a selection or nominating committee. Whatever approach is taken should reflect the need to establish and build long-term support for the mentor program at the school level. Mentor teachers will need both principal and teacher trust and approval if their services are to be used well.

2. Carefully define criteria for mentor teacher nomination and assessment. Legislated selection provisions require that a nominee:

   a. Be a credentialed classroom teacher with permanent status (permanent status means tenure in those districts which grant tenure or three years experience in districts which do not grant tenure)

   b. Has substantial recent experience in classroom instruction

   c. Has demonstrated exemplary teaching ability, as indicated by, among other things, effective communication skills, subject matter knowledge, and mastery of a range of teaching strategies necessary to meet the needs of pupils in different context

   Districts should consider criteria such as the following in selecting mentors:

   o Demonstrates knowledge and commitment to subject matter

     - Subject matter expertise
     - Ability to convey enthusiasm for the subject to students

   o Demonstrates belief in student ability to succeed

     - Commitment to setting high expectations for students
     - Competence to teach at various student ability levels
     - Use of appropriate grading standards, including resistance to the practice of giving inflated grades
     - Willingness to give special attention to students requiring help
     - Success in fostering excellent student performance

   o Gives evidence of professional stature

     - Leadership, e.g., in organizing projects on his or her own initiative
     - Recognition by those in the same profession
     - Respect of his or her colleagues

(Document 2)

3. Carefully define process for assessment of mentor candidate qualifications. The assessment of candidate qualifications is a critical process which will require careful definition for how candidates can be objectively assessed for nomination and/or selection. The legislated selection process includes provisions for classroom observation of candidates by administrators and classroom teachers employed by the district. Selection committees may wish to provide a few alternate nominees for consideration by the governing board. This would allow the governing board to avoid repeating the selection process if one or more mentor nominees is unable to serve.

III. Considering Potential Mentor Responsibilities

The Mentor Teacher Program should be closely linked to existing staff development and school improvement initiatives. For example, a mentor might function as a content or subject matter specialist across several schools. Another approach might be for the mentors to model new curriculum and instructional strategies for experienced teachers. Outlined below are some approaches which should be considered in defining the roles of mentor teachers. It is important to note that the roles described below are only examples of what mentors might do. In addition, not all mentors in a district need to be limited to a single role. For example, it might be appropriate and desirable for some of the district's mentors to be working in each of these roles.

a. Lead teacher or master teacher assigned to provide staff development for school staff. In this configuration, a mentor teacher would be assigned as a staff developer at a school site. A mentor might:

   - Provide training, classroom observation, conferencing and coaching support for a group of teachers being retrained.

   - Function as a content and methodology specialist at a school site for designated grade levels or content areas.

   - Teach a regular sequence of courses, but provide opportunities for other teachers to observe in the mentor's classrooms, practice new skills, receive feedback and be supported through coaching in their own classrooms.

b. Mentor teacher as lead teacher or master teacher specifically assigned to retrain experienced teachers. As enrollment has declined and teachers have left the profession, existing staff have often been reassigned to shortage areas and many California teachers are not now working in their primary subject area. A mentor assigned as a lead teacher might help existing staff upgrade their skills in their newly assigned subject areas.

c. Mentor as professional trainer of Teacher Trainees. Should a district decide to use teacher trainees, these persons will have baccaleaureate degrees, but no professional preparation in education. Mentors would be responsible for working with the district and the trainee to develop and implement a professional development plan for the trainee.

Trainees might function as interns in mentor teacher classrooms, or mentors might be available for part of the instructional day to discuss curricular, instructional, and management issues with these new classroom teachers. Given the responsibility of the mentors for oversight of the trainees, districts should protect the instructional time of mentors in their own classrooms and be realistic about the number of trainees with whom mentors can be expected to work effectively.

d. Mentor teachers as guides for new teachers. The first year of teaching is the most difficult, as research suggests that much of what teachers learn about teaching is learned "on the job." Hence, mentors could work with new teachers (that is, newly hired fully credentialed teachers--not "teacher trainees") to help upgrade their content knowledge, refine their instructional skills, and develop effective classroom management systems.

e. Mentor teacher as "fellow" in teacher training academy. Designated mentors might be grouped in a teaching academy where teachers with particular expertise would constitute a "demonstration" school. Schenley High School in Pittsburgh, Pennsylvania provides such an example. This program provides a clinical teaching experience in a regular high school where teachers observe exemplary instructional activities, are able to practice and receive feedback on instructional skills, and receive continued support for using new concepts, skills, and processes in their own instruction.

f. Mentor teacher as "curriculum developer". Mentor teachers may be assigned to develop and install new curriculum materials. There is substantial evidence that the quality of textbooks and instructional materials has declined as students have increasing difficulty in reading materials "at grade level". In addition, there is frequently a mismatch between the classroom text, instructional content and standardized tests. Thus, mentors might be designated to work in the summer or in noninstructional time to develop curriculum and assist in classroom-level implementation.

IV. Supporting Mentor Teachers in Their New Roles

1. Provide training for mentors. Teaching adults is a significantly different process from teaching children. Adult motivations, habits, attitudes, and skills are different from those of children and need to be accommodated in the training activity. Most mentors will be working as advisors to the teaching process. Hence, if the mentor is to observe and work with teachers in classrooms, the mentor needs expertise in observation, conferencing, and clinical teaching support. If the mentor lacks expertise in these areas, training for the mentor needs to be provided.

2. Secure commitment from site administrators and teachers for work with the mentor: Mentor teachers are most likely to work with teachers at individual school sites. Observing in classrooms, sharing instructional strategies, modeling teaching ideas, and providing resources will require a strong degree of trust among mentors and site teachers and administrators. We recommend that site personnel make a specific commitment to the role of the mentor which realistically reflects what the mentor can do, prior to assignment to the site.

3. Set reasonable expectations about what mentors can accomplish. The organization of a mentor teacher's time should be dictated by the role he or she is expected to fulfill. The law states that not less than 60 percent of mentor's time shall be spent in direct instruction of pupils, but this doesn't preclude individuals from spending more or even all of the time in direct instruction of pupils, (e.g., the "training academy" notion).

   If mentor teachers are to improve instructional quality, their duties must be thoughtfully planned in light of specific local needs and goals for improving curriculum and instruction. We cannot overstate the need to be realistic about how much a single mentor teacher or group of mentors can accomplish. Prior experience with educational reform efforts suggests that many promising reforms fail because of unrealistic expectations that the reform can solve all problems.

4. Provide a forum for mentor teachers to assist one another. Mentor teachers are likely to observe other teachers' teaching and comment upon it. Thus, districts need to ensure both that mentors are trained to observe and make judgments about instruction, and that they are supported in this role as supervisors, not as evaluators. As participants in a new activity, mentors will need to be given opportunities where they can share and improve upon their mentoring skills. With this in mind, districts might want to provide a forum where mentors can share alternative approaches for working in particular settings and receive feedback from classroom teachers on their perceptions of the mentor's performance.

(Document 2)

DEPARTMENT OF EDUCATION ROLE AND TIME LINES

The Department's role in implementation of the Mentor Teacher Program includes:

- Recommendation of Rules and Regulations to the California State Board of Education for approval in January 1984
- Annual determination of the number of teachers employed by each school district to allocate funds to participating school districts, including provisions for participation by districts which have five or fewer certificated employees
- Allocation of monies to participating school districts to support stipends, and reimburse the necessary costs of participation in the program
- Report to the Legislature by November 15, 1983 on Department of Education progress in implementing the law

Over the next few weeks and months, the Department will be engaged in the following activities to support implementation of the program:

- Dissemination of this advisory paper to the field, including requests for district letters of intent to participate in the program
- Review of draft Rules and Regulations by a field task force representing various constituencies interested in the Mentor Teacher Program, including teachers, administrators, teachers' association personnel, representatives of school boards, staff developers, representatives from institutions of higher education, business and industry, and researchers and practitioners in the implementation of teacher incentive plans
- Submission of regulations for State Board of Education review at its December meeting
- Preparation of a technical assistance handbook to describe various approaches districts might consider in designing local programs

LETTERS OF INTENT AND ALLOCATION OF FUNDS

Stipend funding. The legislation stipulates that participating districts shall provide each mentor with an annual stipend of no less than $4,000 over and above the regular salary to which the mentor is entitled. The $4,000 stipend is for a full-year of service as a mentor and AB 70 of 1983 made provision for this amount to be prorated for less than a full-year of service. In this first year of implementation, it is expected that mentors will serve only one half of the 1983-84 school year; thus the state will apportion $2,000 per 1983-84 mentor for stipend purposes.

(Document 2)

Mentor stipends are not to be counted as salary or wages for purposes of calculating employer contribution rates or employee benefits under the State Teacher's Retirement System. The district governing board may designate certificated employees as mentor teachers and pay such persons stipends for a period not to exceed three consecutive school years. Upon completing three years as a mentor teacher, an individual may be reviewed and renominated. It should be noted that designating an individual as a mentor for three years does not obligate the state to provide stipend support for each of those years. State appropriations are made annually and allocations to districts are always subject to the availability of funds in any given year.

Current and future year funding. The Legislature has appropriated $10,400,000 for the Mentor Teacher Program for the second half of 1983-84. Full funding of 5 percent of the state's approximately 165,000 full-time certificated teachers would require $49,500,000 or $24,750,000 for half of a year. If the appropriated funds prove to be insufficient to cover all requests, then, the State Superintendent will decrease the percentage multiplier (initially specified at 5 percent if full funding were available) for all districts, in accordance with Education Code Section 44492.3. In this case all districts will be able to participate if they choose, but the maximum number of mentors in each district will be reduced (from 5 percent) to the percent designated by the Superintendent.

Apportionment of funds to participating districts. The Department has responsibility to annually review district funding applications and award monies to districts. Given the short time and the necessity to prorate existing participation, districts are being asked to submit the attached letter of intent to participate in the Mentor Teacher Program to the Office of Staff Development by December 15, 1983. While this does not commit the district to participate, it will provide the Department with a pool of potential participants from which to calculate the percentage multiplier for 1983-84. Districts not submitting the enclosed form by December 15, 1983 will not be considered for participation in 1983-84.

Use of funds. Section 26 of AB 70 requires that no more than one-third of the total state funding appropriated for the Mentor Teacher Program shall be used for necessary costs of participation beyond stipends. At least two-thirds of the funding is to be used for stipends. It is anticipated that each district's 1983-84 allocation of funds will reflect this 1/3 to 2/3 relationship so that each district will receive no more than $1,000 of administrative cost funding for each $2,000 of stipend funding.

Districts may choose to use or form into consortia or cooperatives to pool administrative costs of the mentor program. However, letters of intent to participate should be submitted by each district on an individual basis.

(Document 2)

Availability of funds for 1984-85. Funding is contingent upon annual legislative appropriations. Current funds will support the Mentor Teacher Programs for the second half of the 1983-84 school year. Legislative augmentation (needed to "annualize" the funding) or even continuation of the current funding level after July 1, 1984 is not guaranteed.

Districts deciding not to participate in the program during 1983-84. Districts opting not to participate during 1983-84 will have an opportunity to participate in subsequent years only if additional funding is appropriated by the Legislature.

Contact person: Dr. Laura A. Wagner, Director
Office of Staff Development
California State Department of Education
721 Capitol Mall
Sacramento, CA 95814
(916) 322-5588

(Document 2)

Return by December 15, 1983 to:

Mentor Teacher Program
c/o Dr. Laura A. Wagner
Director
Office of Staff Development
California State Department of Education
721 Capitol Mall
Sacramento, CA 95814
(916) 322-5588

CALIFORNIA MENTOR TEACHER PROGRAM

STATEMENT OF INTENT TO PARTICIPATE

The ______________________________ school district or county office hereby indicates its intent to participate in the California Mentor Teacher Program during the 1983-84 school year.

In 1983-84, the district employs ______ certificated classroom teachers.

____
Superintendent

____
Address

____
City, State, ZIP

____
Phone

____
Contact person if other than Superintendent

CALIFORNIA MENTOR TEACHER PROGRAM

EC 44490-44496 (Document 2)

1. Effective: July 28, 1983
2. Funding: $10.5 million for 1983-84
3. Permissive
4. No Board Policy required
5. Rules and Regulations to be provided on or before January 1, 1984, by the State Board of Education
6. May impact negotiations (Trailer Bill will determine if bargainable)
7. Application required

General Information

The California legislature sees the mentor teacher program as an attempt to provide incentives to teachers of demonstrated ability to stay in the public school system. The State Board of Education is required to establish rules for implementation by January 1, 1984.

The maximum number of mentor teachers allowed per district is 5 percent of the total number of permanent certificated classroom teachers. The selection and designation of mentor teachers will be through a local selection process involving teachers, administrators, parents, pupils, and other public representatives with final selection being made by the local governing board.

Mentors must be: (1) credentialed classroom teachers with permanent status, (2) have substantial recent experience in the classroom, and (3) have demonstrated exemplary teaching ability. Mentors will receive a stipend of $4,000 which is not counted as salary for purposes of calculating employer contributions to STRS. Districts may also receive reimbursement for necessary administrative costs at the discretion of the Superintendent of Public Instruction. Allowable substitute and administrative costs will be defined in the regulations. Mentor teachers must spend an average of 60 percent of their time in direct instruction of pupils.

Districts must be aware that if deficits occur they will be passed on to the districts on a pro rata basis. However, it appears that the deficit cannot be passed on to the teacher. The districts may have to absorb deficits in this program.

A mentor teacher designation cannot exceed three consecutive school years without review and renomination of the teacher. Although the final designation of who is chosen to be a mentor teacher rests with the governing board, a majority of the membership of the selection committee must be classroom teachers. The actual teachers on the selection committee are to be chosen by other certificated classroom teachers.

The level of funding for 1983-84 assumes stipends of not more than $2,000 for about 3.5 percent of the total number of permanent certificated teachers.

Districts desiring to participate in the mentor teacher program should begin preparing for the program prior to receiving the rules and regulations from the state. A district can set its own criteria for the use of mentors. It is important that a district not be hurried into collective bargaining regarding the mentor teacher program prior to the receipt of the rules and regulations put out by the state.

(Document 2)

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The level of funding for 1983-84 assumes stipends of not more than $2,000 for about 3.5 percent of the total number of permanent certificated teachers.

Districts desiring to participate in the mentor teacher program should begin preparing for the program prior to receiving the rules and regulations from the state. The primary function of mentor teachers is to provide guidance to new teachers, staff development, and curriculum development. However, a district can set its own criteria for the use of mentors. It is important that a district not be hurried into collective bargaining regarding the mentor teacher program prior to the receipt of the rules and regulations provided by the state.

Article 4. California Mentor Teacher Program

SEC. 12. Section 44490 of the Education Code is amended to read:

AB 70

44490. The Legislature recognizes that the classroom is the center of teaching reward and satisfaction. However, the Legislature finds that many potentially effective teachers leave the teaching profession because it does not offer them support, assistance, recognition, and career opportunities that they need.

It is the intent of the Legislature in the enactment of this article to encourage teachers currently employed in the public school system to continue to pursue excellence within their profession, to provide incentives to teachers of demonstrated ability and expertise to remain in the public school system, and to restore the teaching profession to its position of primary importance within the structure of the state educational system.

AB 70

SEC. 12.5. Section 44491 of the Education Code is amended to read:

44491. (a) There is hereby established the California Mentor Teacher Program. On or before November 15, 1983, the Superintendent of Public Instruction shall recommend to the State Board of Education, and on or before January 1, 1984, the State Board of Education shall prescribe, rules and regulations establishing guidelines for the implementation of mentor teacher programs in school districts.

(b) The adopted rules and regulations shall specify that persons seeking classification as a mentor teacher shall meet each of the following qualifications:

AB 70

(1) Is a credentialed classroom teacher with permanent status or, in any school district with an average daily attendance of less than 250 pupils, is a credentialed classroom teacher who has completed at least three consecutive school years as an employee of the district in a position requiring certification qualifications.

(2) Has substantial recent experience in classroom instruction.

(3) Has demonstrated exemplary teaching ability, as indicated by, among other things, effective communication skills, subject matter knowledge, and mastery of a range of teaching strategies necessary to meet the needs of pupils in different contexts.

(Document 2)

AB 70

SEC. 12.7. Section 44492 of the Education Code is amended to read:

44492. (a) Out of the funds available for that purpose, the superintendent shall allocate funds to participating school districts for the purpose of providing stipends to mentor teachers. The superintendent shall annually make a determination as to the number of certificated classroom teachers employed by each participating school district and may authorize the district to designate as mentors up to 5 percent of the total number of certificated classroom teachers in the district. Teachers designated as mentors shall meet the minimum qualifications established by subdivision (b) of Section 44491.

AB 70

The superintendent shall increase any fraction resulting from the 5 percent calculation to the next integer, and shall allow districts which have at least five certificated employees to designate one classroom teacher as a mentor teacher.

(b) Each district which has less than five certificated employees shall be eligible for an amount of funding in the mentor teacher program computed by multiplying the number of certificated employees in the district by 5 percent, and multiplying the result by four thousand dollars ($4,000).

(c) Out of the funds available for that purpose, the superintendent shall, in the exercise of his or her discretion, allocate to participating school districts an amount which the superintendent determines to be sufficient to reimburse the necessary costs of participation in the mentor program. For purposes of this subdivision, necessary costs of participation in the mentor program shall include, but not be limited to, the costs of employing a substitute classroom teacher for a mentor teacher who uses all or part of his or her stipend for professional growth or release time, and costs of administering the program.

If at the end of any fiscal year, an amount of the funds available for purposes of this subdivision remains unallocated, the Superintendent of Public Instruction shall utilize the unallocated amount for purposes of subdivision (a) or (b) in the next fiscal year.

(d) Any school district may apply for and receive funds for the purposes of this program.

44492.3. In the event that funds available for purposes of providing stipends to mentor teachers are insufficient to provide stipends for the maximum number of certificated classroom teachers authorized to be designated as mentors pursuant to subdivision (a) of Section 44492, the Superintendent of Public Instruction shall decrease the percentage multiplier established in subdivisions (a) and (b) of Section 44492 so that the allocation and authorized number of mentors for each participating school district would be decreased on a pro rata basis.

44492.5. On or before November 15, 1983, the Superintendent of Public Instruction shall submit a report to the Legislature which shall include the superintendent's plan for the programmatic review of applications submitted by districts for funding pursuant to Section 44492, and a summary of the implementation of the California Mentor Teacher Program to date.

44493. Participating school districts receiving funding pursuant to Section 44492 shall establish a special account exclusively for the support of the mentor teacher program. None of the funds allocated by the superintendent pursuant to subdivision (a) of Section 44492 for purposes of providing stipends to mentor teachers shall be used by the participating district for the cost of administering the program.

(Document 2)

AB 70

AB 70

SEC. 13. Section 44494 of the Education Code is amended to read:

44494. (a) On or before September 1 of each year, participating school districts which receive funding pursuant to subdivision (a) of Section 44492 shall allocate no less than four thousand dollars ($4,000) to provide each qualified mentor with an additional annual stipend over and above the regular salary to which he or she is entitled. The amount of the annual stipend shall be four thousand dollars ($4,000) for a full school year of service as a mentor, or a pro rata share of that amount for less than a full school year of service as a mentor, except that participating school districts which receive funding pursuant to subdivision (b) of Section 44492 shall allocate the full amount so received to provide a qualified mentor with an additional annual stipend over and above the regular salary to which he or she is entitled. This stipend shall not be counted as salary or wages for purposes of calculating employer contribution rates or employee benefits under the State Teachers' Retirement System.

(b) A mentor may propose that the district allocate all or part of the stipend for his or her professional growth or release time.

(c) The governing board may designate certificated employees as mentor teachers pursuant to Section 44491 and pay these persons the additional annual stipend authorized under subdivision (a) for a period not to exceed three consecutive school years. Upon completing three years as a mentor teacher, an individual may be reviewed and renominated.

(d) The subject of participation by a school district or an individual certificated classroom teacher in a mentor teacher program shall not be included within the scope of representation in collective bargaining among a public school employer and eligible employee organizations.

44495. The selection procedures for the designation of certificated classroom teachers as mentor teachers shall, at a minimum, provide for the following:

(a) A selection committee shall be established to nominate candidates for selection as mentor teachers. The majority of the committee shall be composed of certificated classroom teachers chosen to serve on the committee by other certificated classroom teachers. The remainder of the committee shall be composed of school administrators, chosen to serve on the committee by other school administrators. The governing board of a participating school district shall consider including parents, pupils, or other public representatives in the selection process, and may, at its option, include such persons.

(b) Candidates for mentor teacher shall be nominated by the majority vote of the selection committee.

(c) The selection process shall include provisions for classroom observation of candidates by administrators and classroom teachers employed by the district.

(d) The final designation of any person as a mentor teacher shall be by action of the governing board of the school district from persons nominated pursuant to subdivision (b). The governing board may reject any nominations.

44496. (a) Persons designated as mentor teachers pursuant to this article shall be assigned duties and responsibilities in accordance with the following:

(1) The primary function of a mentor teacher shall be to provide assistance and guidance to new teachers. A mentor teacher may also provide assistance and guidance to more experienced teachers.

(2) Mentor teachers may provide staff development for teachers, and may develop special curriculum.

(3) A mentor teacher shall not participate in the evaluation of teachers.

(b) No administrative or pupil personnel services credential shall be required of any mentor teacher. Each mentor teacher shall spend, on the average, not less than 60 percent of his or her time in the direct instruction of pupils.

AB 70 (c) For the purposes of determining administrator-teacher ratios, mentors shall be considered full-time teachers.

AB 70 SEC. 15. Section 44497 is added to the Education Code, to read:

44497. For purposes of this article, "school district" shall include county offices of education.

AB 70 SEC. 26. (a) The Superintendent of Public Instruction shall allocate of the amount allocated from Section A of the State School Fund for the teacher mentor program for the 1983–84 fiscal year pursuant to paragraph (5) of subdivision (a) of Section 41303.3 of the Education Code at least two-thirds of the total funds for stipends pursuant to subdivisions (a) and (b) of Section 44492 of the Education Code, and no more than one-third of the total funds for necessary costs of participation in the mentor program pursuant to subdivision (c) of Section 44492 of the Education Code.

copies

PLANNING FOR THE EDUCATIONAL USE
OF
MICROCOMPUTERS

October 1982

Prepared By
Carroll J. Bravo

California State Department of Education
Educational Technology Unit
721 Capitol Mall
Sacramento, CA 95821

INTRODUCTION

Planning is an integral part of the educational process. The use of educational technology, especially microcomputers, must be included in the total planning effort at both the school district and local school levels. This planning should be coordinated with the ongoing planning and decision-making processes that are already established, not set up as a peripheral, added-on planning process.

The checklist is made up of a series of items that might be considered as the planning process takes place. Some items may not be applicable to specific planning, but others may be appropriate. The implementation of the microcomputer into the educational system should be done in an effective and well-planned manner. Careful considerations and decisions based on the best information available will pay off in the long run.

PLANNING FOR THE EDUCATIONAL USE OF MICROCOMPUTERS

(CHECKLIST)

AREAS OF PLANNING	Not Appli-cable	Plan-ned	In Prog.	Comp-leted
I. DEVELOP THE PLAN				
Identify a Planning Group:				
o Chairperson				
o Representative membership				
o Criteria for planning process				
Develop an overall program plan for using computers:				
o To improve achievement				
o To remediate				
o To assess achievement				
o For enrichment				
o For individualization				
o To improve attendance				
o For diagnosis				
o Vocational instruction				
o Independent study				
o Other ______________________				
Identify User Groups:				
o Staff assignments				
o All students				
o Gifted & Talented				
o Special Education				
o Low-motivated				
o Dropouts				
o Remedial				
o Specific Curriculum Areas				
o Vocational Education				
o Bilingual				
o Other______________________				
Consider Other Planning Areas:				
o Identify specific goals - reasons for using computers				
o Identify specific long-range objectives (next 3 years)				
o Short-range objectives (current year)				

PLANNING FOR THE EDUCATIONAL USE OF MICROCOMPUTERS

(CHECKLIST)

AREAS OF PLANNING	Not Applicable	Planned	In Prog.	Completed
o Review available research on computers in instruction				
o Identify those to be involved in the program				
o Identify a coordinator for the program				
o Identify consultant resources to provide assistance				
o Integrate the program with existing curriculum				
Consider Other Planning Areas:				
o Plan equal access for all students to the program				
o Consider community use of computers				
o Fiscal and budgetary considerations				
o Review insurance coverage/policies				
o Other ______________________				
Determine School Level to Begin the Plan:				
o Elementary				
o Junior High				
o Senior High				
o How/when to move to other levels, departments				
o Assure coordination between:				
o buildings				
o levels				
o departments				
o programs				
II. NEEDS ASSESSMENT				
Survey those who will be affected:				
o Identify who is presently computer literate:				
o teachers				
o students				
o parents				
o administrators				
o community				
o Identify who is interested and wants to get involved				
o Determine teacher familiarity with various computers				
o Identify existing programs/people who can provide assistance				

PLANNING FOR THE EDUCATIONAL USE OF MICROCOMPUTERS

(CHECKLIST)

AREAS OF PLANNING	Not Applicable	Planned	In Prog.	Completed
o Plan visitations to other programs				
o Identify existing hardware				
o software				
o location				
o use				
III. USE OF COMPUTERS				
Consider California State Dept. of Education:				
Computer Education Model:				
o Computer Literacy -				
o awareness level				
o operational level				
o competence level				
o Computers for personal and consumer use				
o Computer Assisted Instruction (CAI)				
o Computer centered occupations				
o Computer impacted occupations				
Computer Assisted Instruction (CAI):				
o Design an instructional plan for using computers				
o Determine subject areas for using computers				
o Review existing software/courseware and correlation with existing and planned curriculum				
o Identify who should design this instruction:				
o teachers				
o resource consultants				
o community people				
o students				
o others ______________________				
o Develop learning objectives				
o Plan specific activities to meet objectives				
o Coordinate objectives/activities with total program				
o Develop process for field testing/revising				

PLANNING FOR THE EDUCATIONAL USE OF MICROCOMPUTERS

(CHECKLIST)

AREAS OF PLANNING	Not Appli-cable	Plan-ned	In Prog.	Comp-leted
Computer Managed Instruction (CMI):				
o Identify curriculum areas to be included				
o Investigate software availability				
o Correlate to district/school learning objectives				
o Correlate to district/school testing program				
Administrative Functions				
Design a process for handling:				
o Attendance accounting				
o Address lists				
o Scheduling				
o Business accounting				
o budgets				
o inventories				
o Word processing				
o Student records				
o Student activities				
o Counseling/guidance				
o Library/Media Center accounting/inventories				
o Data Base Manipulation				
o Communications network				
o Other ____________________				
IV. LOCATION OF COMPUTERS				
Determine what the Instructional Plan Requires:				
o Mobil units (carts)				
o Single units in classrooms				
o Multiple units in classrooms				
o Computer center or laboratory				
o Classroom networks				
o Media center/library				
o Other ____________________				
Consider need for Future Expansion of System:				
Determine Security Needs:				

PLANNING FOR THE EDUCATIONAL USE OF MICROCOMPUTERS

(CHECKLIST)

AREAS OF PLANNING	Not Applicable	Planned	In Prog.	Completed
Plan Adequate, Uninterrupted Power Supply at Each Location:				
o Number of circuits and outlets required				
Determine personnel responsible for:				
o Assignment for use				
o Maintenance				
o Repair				
o Inventory Control				
o Check-out				
o Other ______________________				
Decide if hardware/software should be checked out to:				
o Classrooms				
o Overnight to Homes				
o teachers				
o students				
o parents				
o Vacation periods				
o Orientation for those who check out equipment				
o Responsible person on call during check-out period				
V. SELECTING SOFTWARE				
Review school district policy on selecting instructional materials:				
Develop computer software policy, if none exists:				
o Basic materials				
o Supplemental materials				
Establish committee/process for evaluating software:				
o Develop/select software evaluation forms				
o Determine software availability to meet program needs				
o Ascertain if software can be previewed				
o Review software evaluations from other sources				
o Check if software coordinates with existing curriculum				
o Identify if adequate documentation accompanies software				

PLANNING FOR THE EDUCATIONAL USE OF MICROCOMPUTERS

(CHECKLIST)

AREAS OF PLANNING	Not Applicable	Planned	In Prog.	Completed
o Consider copyright law considerations.................				
o Determine number of copies needed for planned program.				
Consider Other Areas for Selecting Software:				
o Content..				
o Instructional Quality................................				
o Technical Quality....................................				
o Skill level needed to use the software				
o beginning level......................................				
o intermediate level...................................				
o competence level.....................................				
o Programs are menu driven.............................				
o Method for user to get out of programs................				
o Persons available who can modify/revise software for local needs...				
o Persons available who can program/produce quality local software..				
o Availability of licensing/duplicating arrangements with selected software producers........................				
o willingness of district office to enter into such arrangements..................................				
VI. SELECTING HARDWARE				
Determine the Kind of Hardware You Need:				
o Review the software to be used in the planned program & the hardware it requires............................				
o Evaluate the merits of the hardware in terms of current & future needs:				
o memory..				
o reputation..				
o cost..				
o ease of use...				
o peripherals available................................				
o disk drives..				
o printers...				

PLANNING FOR THE EDUCATIONAL USE OF MICROCOMPUTERS

(CHECKLIST)

AREAS OF PLANNING	Not Applicable	Planned	In Prog.	Completed
o phone modem				
o paddles, joy sticks				
o light pens				
o other ______________________				
o screen display: Black & White/Color				
o text characters				
o keyboard				
o lower case availability				
o languages to be used and other language availability				
o graphics capability				
o sound/music				
o future expandability - RAM				
o maintenance & service availability				
o Compare hardware from several vendors				
o Visit existing computer installations and programs				
o Check availability of training in computer use from vendor				
o Determine if local user groups exist for selected hardware				
VII. FUNDING AND OTHER RESOURCES Determine Necessary Costs:				
o Lease/buy/rent				
o Software				
o Hardware				
o Peripherals				
o Accessories				
o Installation				
o Insurance				
o Maintenance agreements				
o Supplies				
o Support texts, manuals, etc				

PLANNING FOR THE EDUCATIONAL USE OF MICROCOMPUTERS

(CHECKLIST)

AREAS OF PLANNING	Not Applicable	Planned	In Prog.	Completed
o Staff development				
o Other ______________________				
Correlate with School District Purchasing Policies, bid processes:				
Determine Ongoing Costs Beyond Initial Expense;				
Review Current Budget for Savings Possible Due to Computer Utilization:				
Investigate Possible Funding Sources:				
o Current budget				
o Categorical aid programs				
o state				
o federal				
o Private enterprise				
o Business/industry				
o Local community				
o Other ______________________				
Determine How Other School Districts have Funded Computer Use:				
VIII. STAFF DEVELOPMENT/INSERVICE				
Develop a staff development/inservice plan:				
o Confer with district or school personnel who must approve the plan				
o Identify the staff members to receive inservice				
o Establish the needs of those receiving inservice				
o Level of computer literacy required				
o awareness level				
o operational level				
o competence level				
o Define the inservice goal				
o Define specific objectives/activities for the inservice				
o Decide on amount of time required to achieve objectives				
o Develop the sequence of activities required				

PLANNING FOR THE EDUCATIONAL USE OF MICROCOMPUTERS

(CHECKLIST)

AREAS OF PLANNING	Not Applicable	Planned	In Prog.	Completed
o Consider inservice for others:				
o administrators				
o parents				
o board members				
o community				
o others ______________				
o Identify persons to provide the inservice:				
o local district experts				
o county office of education				
o vendors				
o private consultants				
o TEC Centers				
o college/university				
o Identify resources needed to implement the plan:				
o people				
o materials				
o hardware				
o software				
o support documentation				
o other ______________				
o Design an evaluation process to measure effectiveness of the inservice program				
o Select materials for staff that support an ongoing staff development program:				
o computer magazines, periodicals				
o articles				
o newsletters				
o professional computer organizations				
o local computer user clubs				
o local computer stores				
o conferences, workshops, courses				

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(Document 3)

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MAY 1 8 1981
Office of Staff Development

THE STATE BILINGUAL TEACHER TRAINING PROGRAMS

This brief report will describe the nine State Bilingual Teacher Training (SBTT) Assistance programs currently in operation. It will also provide cummulative information regarding the number of teachers trained and the types of programs available. Finally, this report will also contain recommendations for program continuation and expansion.

History of the Program

These training programs were developed for teachers on bilingual waiver following a budget provision in 1979 that directed the department to fund staff development resource centers for the purpose of providing in-service training for teachers on bilingual waiver. In September of 1981, AR 1379 was passed establishing the State Biliugual Teacher Training Assistance program. Accompanying language broadened the category of agencies eligible for providing training services to teachers but continued to direct these programs toward school districts with high concentrations of pupils of limited-English proficiency and teachers on waiver. Of the original three programs funded by budget language in FY 1979-80, the Los Angeles County program and the Imperial County program are currently in their fourth year of operation. The third School Resource Center program declined funding at the close of the 1980-81 training year with the recommendation that the department redirect funds to at least three of the LEAs being served by their program.

In addition, an increase in funding ($200,000) in 1980-81 resulted in an expansion of program. In response to a statewide request for proposals (RFP), 11 proposals were submitted and four were chosen by a representative panel of eligible agencies for implementation.

Currently, the nine SBTT programs are located at the following sites:

1. Los Angeles County Office of Education, Downey, California
2. Imperial County Office of Education, El Centro, California
3. Fresno, Central Valley Consortium, California State University, Fresno, Fresno, California
4. Orange County Office of Education, Santa Ana, California
5. San Diego Office of Education, San Diego, California
6. Ventura/Santa Barbara Consortium, Ventura, California
7. San Jose Consortium, San Jose, California
8. San Mateo County Office of Education, Redwood City, California
9. Monterey County Office of Education, Salinas, California

(See Chart A for exact location and name of coordinator.)

(Document 3)

Training Capacity and Funding

The SBTT staff development programs are currently providing training for teachers on waiver in 163 school districts in approximately 45 different sites. (See Chart C for number of teachers trained per site.)

Since the first year of implementation, these programs have provided training in the three bilingual competency areas of Language, Culture, and Methodology. It is estimated that 5,920 teachers on bilingual waiver have been trained in one or more of the three competency areas. Approximately 874 of these teachers have acquired the Certificate of Competence as a result of these in-service training resources.

Additionally, these programs have had some impact on the identification of second language acquisition experts and language providers from various agencies throughout the state. Many are private consultants (Maikel) or from commercial language training agencies (Alouette Language Service), bilingual resource centers, or county education and local school district offices. Culture and methodology experts have also been developed or identified increasing the training resource pool available to school districts.

In many instances the sharing of expertise, training materials, and media has occurred between sites (when geographically permissable) resulting in some uniformity of content. Training activities have also been cosponsored by participating school districts and supported by in-kind contributions in the form of release time for teachers, provision of training sites, or resource and administrative staff time.

The funding level of each program is shown on Chart B and is based on the amount requested for program implementation and the negotiated amounts available at the time of funding. The average cost per participant is $534. Differences in program costs are attributable to the variations in program design and are generally related to contract consultant costs, number of teachers served, duration of program, summer sessions, and out of state training components.

The State Department of Education (SDE), Office of Staff Development (OSD) has allocated funds to these projects on a contract basis and through its Local Assistance Bureau (LAB) mechanism.

The Central Valley Consortium, managed by California State University, Fresno, continues to be funded by contract; the other eight sites are presently being funded through LAB.

Criteria for Teacher Selection and Program Description

The following minimum requirements for teachers who participate in these programs are based on the AB 507 requirements for teachers on waiver as restated in AB 1379.

1. That the teacher is working in a bilingual classroom serving pupils of limited-English proficiency and is under a bilingual waiver.

2. That the teachers waiver application includes a certification by an assessor agency approved by the Commission of Teacher Credentialing.

3. That the teacher is enrolled and participating in a program leading to a bilingual specialist credential or a certificate of competency for bilingual-crosscultural instruction.

4. That the teacher demonstrates the ability and commitment to meet the requirements of the certificate of competence.

Each project has provided the SDE, OSD with the assurance that they have recruited teachers for this program who meet the above criteria. Additionally, each training proposal has had to describe the agencies' (1) demonstrated commitment to bilingual education and bilingual teacher training, (2) capability to fully prepare candidates for bilingual certificates of competence in accordance with the criteria for assessment in language culture and methodology, (3) availability of bilingual education staff with demonstrated experience and knowledge of bilingual education training programs, (4) management and supportive services necessary to efficiently and effectively meet the intent of this legislation, and finally, (5) matching funds or in-kind matching resources in support of teachers participating in these training programs.

As stated previously, each program is unique because the training plan has been based on the assessed needs of the teacher population it serves allowing for maximum flexibility in training schedules. Constraints imposed by the number of teachers requiring training, the geographic location, and local available resources are also reflected in each program design. Each program also varies in administrative and management structure. All but two programs are currently managed by county offices of education staff who function as the county coordinators for bilingual education services. A brief description of each project highlighting program scope, content, and training strategies follows:

Alameda (no longer funded)

Established at the Alameda County School Resource Center. Brokered services in the three competency areas over a wide geographic area mainly divided into (1) Northern Consortium serving San Mateo, San Francisco, Marin, Sonoma, Napa, Solano, Contra Costa, and Alameda counties; (2) Southern Consortium serving Monterey County; and (3) Central Consortium serving San Benito, Santa Clara, and Santa Cruz counties. This program relied on the network of resources in place for the SRC which included bilingual trainers from BABEL and CSU, Hayward. The Monterey County, San Mateo, and San Jose Consortium projects were directly funded as a result of the groundwork laid by the Alameda County program.

Imperial County BTTP (August 1982-June 1983)

Originally established at the SRC in Brawley as an Individualized Tutoring program, continues under the management of the Imperial County Teacher Education and Computer Center (TECC). It presently provides High Intensity Language Training (HILT) in Spanish using county and local school district personnel and resources. Utilizes San Diego County Assessor Agency resources and the Orange County BTTP video materials for culture and methodology training.

Los Angeles County BTTP (July 1982-June 1983)

The Los Angeles County program was also established at the SRC and is now coordinated out of the TECC. This program brokers training for 38 school districts and is the largest. Language providers from approximately eight independent agencies and two local bilingual education service centers participate in a Program Advisory Committee that meets monthly to review and modify programs. Through these meetings they are kept informed of the latest legislative changes, research findings, and methodological and technical innovations in the field. Training ratios for culture and methodology are approximately 20 to 1 due to the large numbers being trained. The language training ratios are 10 to 1. The various language providers coordinate training sessions at numerous school sites throughout the county that are easily accessible to teachers after school hours and on Saturdays.

Fresno (July 1983-August 1983)

The Central Valley Consortium offers training at three sites: the Tulare County Office of Education and California State College, Stanislaus with the central administration located at California State University, Fresno. Summer session immersion program providing six hours daily of intensive language experience based on total physical response (TPR) methods and HILT. Culture and methodology are also included in the four-week program. This program has recently been expanded to provide training throughout the year.

Orange County Office of Education (September 1982-August 1983)

Language training is provided at three different sites throughout the year while culture and bilingual methodology is scheduled individually with each consortium district based on their needs. This program provided training and methodology only during its first year of implementation (1980-81) and has since modified its scope to include language. The natural language approach and TRP techniques have been piloted by this program. A videotape series titled "El Espejo" has been developed for the culture component. This media has been widely disseminated to participating districts and other BTTPs upon request.

San Diego County Office BTTP (September 1982-August 1983)

In the 1981-82 program, training through teleconferencing was piloted. This system allowed for a single consultant's presentation at the county office to be relayed to a number of surrounding districts. Direct interaction between presentor and teachers was an important feature of this innovation. Those sessions were videotaped and will continue to be used in future culture and methodology trainings. This program has coordinated FSI presentations that have enabled other BTTPs to review and understand the FSI tests, ratings, and interview techniques. This program coordinates their language training with the Chula Vista HILT program and various other IHEs that provide bilingual resource staff.

Ventura/Santa Barbara (May 1983-April 1984)

The Proyecto Maestro Adelante program developed for the Ventura/Santa Barbara Consortium originally piloted an intensive four week summer session in 1981-82. This has been expanded to year round training plus an out of country four week summer session in Mexico (The training goals for the immersion program in Mexico are consistent with the overall project goals and activities). Training sessions are held at two IHE sites that provide support to the program by providing classroom space at a minimal fee.

Monterey County Office of Education (October 1982-September 1983)

Training in the three competency areas is provided by subcontracted consultants from the Salinas Adult School, San Jose State, and various individual bilingual specialists. Sites for the training are in Salinas and the rural King City areas. The HILT language component is largely based on an existing program which has been offered throughout the county office and the Salinas Adult School. This program will also recommend candidates to the San Mateo BTTP Summer Institute proposed for Mexico for the 1982-83 program year.

San Mateo County BTTP (December 1982-November 1983)

The Bay Area training for teachers on waiver provides language training in Spanish and Cantonese. Two county office coordinators provide management supervision for four training cycles occuring at intervals throughout the year. Language trainers for beginning, intermediate, and advanced levels are bilingual specialists contracted from local IHEs and participating school districts. A four week immersion program in Mexico is proposed for the second consecutive year. All candidates must have an assessed language ability level of 2+ (on the FSI scale or its equivalent) to be eligible to participate.

San Jose Consortium (October 1982-October 1983)

Special attention was given to establishing a support system for teachers on waiver that includes classroom observations and feedback sessions. These activities are assigned to an experienced teacher-trainer. It is anticipated that the individualized feedback on classroom performance will assist teachers and also increase the documentation of teacher progress toward the Certificate of Competence. A summer intensive program is proposed that will provide teachers an opportunity to practice and apply concepts taught in the language, culture, and methodology courses.

Evaluation and Program Management

Each project is required to provide an internal evaluation design which is used to measure the successful achievement of program goals and objectives.

(Document 3)

This design in many cases is based on an established model already in use by the responsible LEA. For example, project coordinators collect data throughout the year obtained from needs assessment questionnaires, participant course rating instruments, program site visits, and teacher interviews. This information is aggregated with other relevant data (e.g., numbers of teachers trained) to provide an overall program evaluation from which an end of year report to the SDE is prepared. Evaluation support is often provided by the host agency in the form of a staff evaluator however, in some projects evaluation services are provided by an outside contract evaluator.

The evaluation component of each training plan must contain goals and objectives related to the bilingual competency requirements in Language, Culture, and Methodology. Time lines are requested so that each project can demonstrate that sufficient planning and scheduling has occurred to ensure the success and adequate pacing of program activities.

Ongoing program monitoring and supervision provisions are required as part of the management plan. Program modifications are reported to the SDE, OSD as plan revisions and are usually accompanied by budget revisions when applicable. Program directors meetings are held jointly with, but prior to the bilingual county coordinators meetings chaired by the Office of Bilingual Bicultural Education (OBBE). The OSD recommended these joint sessions in order to provide all BTTP coordinators with up-to-date information on bilingual regulations, research data, and to provide them an opportunity for cross-fertilization of ideas related to training strategies, workshop presentations, and capacity building.

The success of these programs has been measured primarily by the number of teachers who qualify for the Certificate of Competence. For the first two years of the program (1979-80, 1980-81), the pool of eligible teachers included many having some second language background and preparation. These teachers were closest to passing the language competency therefore, "getting them off waiver" occurred within a short time span. Currently, the majority of teachers on waiver have little or no second language ability and will require a much longer training span in order for them to prepare for the language component. Current research on second language acquisition pegs the length of time required for adults to acquire proficiency in a second language at 3.5 to 4 years.

Other issues for consideration in determining the success of this program are related to the improved effectiveness of teachers as a result of their bilingual skills and ongoing staff development required to maintain their bilingual skills.

The following recommendations identify areas of concern for review by the SDE and Legislature. If accepted, these recommendations would result in broader state impact and effectiveness.

Recommendations

1. Some areas of the state do not have access to the State BTTP programs. The Riverside area in the South and the Modesto area in the Central Valley expressed an interest in training assistance when they submitted

(Document 3)

plans in response to the 1980-81 request for proposals. Although they could not be funded at that time, it is recommended that some of the funding currently available for training be redirected to these areas for the development of in-service training programs.

2. There is a need to collect more specific data related to the tracking of teachers who drop out of training sessions, are reassigned to another region, or discontinue preparation for the Certificate of Competence. It is recommended that a data collection source be established by SDE to capture these statistics in order to get at exact numbers of teachers that this program assists.

3. There is little empirical data available on the long-term effects of bilingual in-service training for teachers. It is recommended that the SDE fund a research project to (1) study these effects and (2) review the delivery models developed by the state training programs for their effectiveness.

A

BILINGUAL TEACHER TRAINING CENTERS

(Document 3)

BTTC
IMPERIAL COUNTY SCHOOLS OFFICE
1398 SPERBER ROAD
EL CENTRO, CALIFORNIA 92243

MARGIE ATWOOD
(619) 339-6478

BTTC
LOS ANGELES COUNTY SCHOOLS OFFICE
9300 EAST IMPERIAL HIGHWAY
DOWNEY, CALIFORNIA 90242

SARA ORTIZ
(213) 922-6811

BTTC
CALIFORNIA STATE UNIVERSITY - FRESNO
CENTRAL VALLEY BILINGUAL CONSORTIUM
SHAW AND CEDAR AVENUES
FRESNO, CALIFORNIA 93720

JUAN FLORES
(209) 294-2765

BTTC
ORANGE COUNTY OFFICE OF EDUCATION
POST OFFICE BOX 15029
1300 SOUTH GRAND AVENUE
SANTA ANA, CALIFONIA 92705

BARBARA GONZALEZ
(714) 953-3900

BTTC
SAN DIEGO COUNTY OFFICE OF EDUCATION
6401 LINDA VISTA ROAD
SAN DIEGO, CALIFORNIA 92111

ROSALIA SALINAS
(619) 292-3522

BTTC
VENTURA/SANTA BARBARA CONSORTIU
535 EAST MAIN STREET
VENTURA, CALIFORNIA 93009

CLIFF RODRIGUES
(805) 654-2769

BTTC
MONTEREY COUNTY OFFICE OF
EDUCATION
POST OFFICE BOX 80851
SALINAS, CALIFORNIA 93912

DAVID R. DELGADO
(408) 424-0654

BTTC
SAN JOSE CONSORTIUM
SAN JOSE AREA BILINGUAL
CONSORTIUM
1605 PARK AVENUE
SAN JOSE, CALIFORNIA 95126

CELIA CASTANEDA
(408) 998-6010

BTTC
SAN MATEO COUNTY OFFICE OF
EDUCATION
333 MAIN STREET
REDWOOD CITY, CALIFORNIA 94063

TONY GONZALES
(415) 363-5400

rb

TOTAL NUMBER OF TEACHERS TRAINED (Document: 3)

	1979-80	1980-81	1981-82	1982-83
ALAMEDA COUNTY SCHOOL RESOURCE CENTER	125	161	0	0
IMPERIAL COUNTY SCHOOL RESOURCE CENTER	22	47	35	to date 31 anticipated 11 42
LOS ANGELES COUNTY SCHOOL RESOURCE CENTER	522	450	889	to date 908 anticipated 150 1,058
CALIFORNIA STATE UNVERSITY - FRESNO		54	65	80
ORANGE COUNTY OFFICE OF EDUCATION		308	499	600
SAN DIEGO COUNTY OFFICE OF EDUCATION		49	61	to date 39 anticipated 45 84
VENTURA/SANTA BARBARA CONSORTIUM			161	105
MONTEREY COUNTY OFFICE OF EDUCATION			90	100
SAN JOSE CONSORTIUM			26	75
SAN MATEO COUNTY OFFICE OF EDUCATION			78	90
TOTAL PER FISCAL YEAR	669	1,113	1,904	2,234

FUNDING FOR SBTT PROGRAMS

(Document 3)

D.

	1979 - 80	1980 - 81	1981 - 82	1982 - 83	Total Funding
ALAMEDA COUNTY SCHOOL RESOURCE CENTER	$146,485	$157,000			$ 303,485
IMPERIAL COUNTY SCHOOL RESOURCE CENTER	12,000	15,000	14,600	14,759	56,359
LOS ANGELES COUNTY SCHOOL RESOURCE CENTER	341,515	373,000	360,665	364,508	1,439,688
CALIFORNIA STATE UNIVERSITY - FRESNO		52,057	49,657	50,186	151,900
ORANGE COUNTY OFFICE OF EDUCATION		48,666	46,466	46,959	142,091
SAN DIEGO COUNTY OFFICE OF EDUCATION		47,991	34,858	35,229	118,078
VENTURA/SANTA BARBARA CONSORTIUM		51,285	48,886	49,407	149,578
MONTEREY COUNTY OFFICE OF EDUCATION			43,000	43,460	86,460
SAN JOSE CONSORTIUM			59,318	59,947	119,265
SAN MATEO COUNTY OFFICE OF EDUCATION			69,800	70,545	140,345
SDE, ADMINISTRATION			55,000	55,000	110,000
TOTAL FUNDING PER FISCAL YEAR	$500,000	$745,000	$782,250	$790,000	$2,817,250

TOTAL NUMBER OF TEACHERS RECEIVING CERTIFICATES OF COMPETENCE (Document 3)

	1979-80	1980-81	1981-82	1982-83	Total per site
ALAMEDA COUNTY SCHOOL RESOURCE CENTER	48	79	0	0	127
IMPERIAL COUNTY SCHOOL RESOURCE CENTER	14	12	4	to date 1 anticipated 11 12	42
LOS ANGELES COUNTY SCHOOL RESOURCE CENTER	141	125	93	to date 31 anticipated 44 75	434
CALIFORNIA STATE UNVERSITY - FRESNO	0	4	17	17	38
ORANGE COUNTY OFFICE OF EDUCATION	0	15	14	to date 43 anticipated 30 trained 73	102
SAN DIEGO COUNTY OFFICE OF EDUCATION	0	1	6	to date 7 anticipated 9 16	23
VENTURA/SANTA BARBARA CONSORTIUM	0	12	24	anticipated 10	46
MONTEREY COUNTY OFFICE OF EDUCATION	0	0	3	anticipated 10	13
SAN JOSE CONSORTIUM	0	0	10	anticipated 10	20
SAN MATEO COUNTY OFFICE OF EDUCATION	0	0	9	anticipated 20	29
TOTAL NUMBER OF TEACHERS TRAINED PER FISCAL YEAR	203	248	180	243	874

ANNEXE III

Documentation sur Mountain View-Los Altos High School District: Présentation

SCHOOL OF THE MONTH

THE MOUNTAIN VIEW-LOS ALTOS UNION HIGH SCHOOL DISTRICT

MOUNTAIN VIEW, CALIFORNIA

This district's home-to-school computer networking project may someday make report cards obsolete—and the project's possibilities don't end there.

What do you do when you discover you have a tremendous amount of information about the performance of each student in your school, but no efficient, meaningful way to share it with the student's parents? At the Mountain View-Los Altos Union High School District, the answer was to develop a unique pilot project that uses microcomputers and modems to let parents and students communicate with the guidance department—without ever leaving their homes. This Home-School Computer Network Project (HSCN), as it's been dubbed, began its trial run at the two high schools in this Silicon Valley district just this past March. But already the district plans to expand the network to handle attendance and grade reporting, library bibliographies for student research, and more (see the timetable on page 30). What's more, Superintendent Paul Sakamoto, who conceived the project, says he even foresees the day when "quarterly report cards are obsolete."

Superintendent Paul Sakamoto demonstrates his district's Home-School Network Project to two Los Altos students.

By Art Dudley

Art Dudley is an Assistant Editor on the staff of Electronic Learning.

How the System Works

The heart of the HSCN system is a powerful (256K) Onyx microcomputer with a 20 megabyte hard disk drive. This central computer, which holds the networking software and stores the guidance data to be accessed, is located in the Los Altos High School in Los Altos, CA, and is connected to a phone line through a modem. Atari 800 microcomputers are located in the guidance offices in both the Los Altos and the Mountain View high schools, allowing the staff to input and access data as necessary.

When a student or parent wants access to guidance department information via their own home computer, he or she simply dials the proper phone number and calls up the HSCN menu. (Before the menu appears on the screen, the user automatically "receives" the Mountain View-Los Altos electronic bulletin board, with details of upcoming events ranging from PTA meetings to school dances.)

When the menu comes on the screen, the user is given a choice between two types of information:

THE MOUNTAIN VIEW-LOS ALTOS UNION HIGH SCHOOL DISTRICT AT-A-GLANCE

Location: Mountain View High School is in Mountain View, CA; Los Altos High School is in neighboring Los Altos, CA.

Enrollment: 3,206, combined, grades 9–12.

Guidance Staff: 5 counselors at Mountain View, 6 at Los Altos.

Total Budget: $10.9 million, combined.

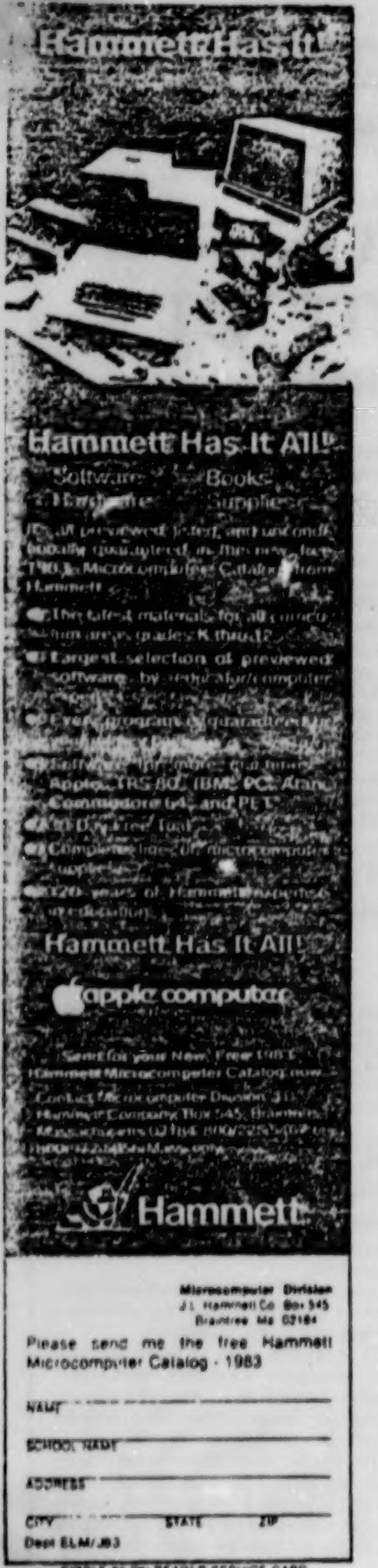
1) **Recall.** This is straightforward data, such as a student's transcript, attendance reports, and course information.

2) **Analysis.** This is when the user requests a review of a student's work against a given standard—e.g., graduation requirements, admissions standards for a particular school, or state financial aid guidelines.

The system, which allows the use of practically any popular home computer, can handle up to five calls at the same time. It takes roughly one minute for a requested program to be loaded from the central Onyx com-

(Continued on page 30)

Photo by Mark Tuschman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- Every program guaranteed [illegible]
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NAME ____________________
SCHOOL NAME ____________________
ADDRESS ____________________
CITY ________ STATE ________ ZIP ________
Dept ELM/J83

CIRCLE 37 ON READER SERVICE CARD

PROJECTED USES OF THE MOUNTAIN VIEW-LOS ALTOS UNION DISTRICT'S NETWORKING PROJECT

The Home-School Computer Network

Since the Mountain View-Los Altos networking system was conceived to help the district's guidance staff, that phase of the system is being implemented first. But now that the basic network has been established, putting it to work in other areas will be a relatively simple matter of inputting additional data and, for some applications, investing in a few more computers.

The accompanying table describes the different possible phases of the networking system (as conceived so far), with estimates of the implementation dates for each.

APPLICATION	IMPLEMENTATION DATE
Counseling/Guidance Parents and students can access student transcript data as either straightforward information or in the context of requirements for graduation, scholarships, or college admission.	Fall, 1983
Attendance School personnel or parents can have immediate access to a student's overall attendance record, or can determine if a student is indeed present on a given day.	Late Fall, 1983 or Spring, 1984
Grade Reporting Parents can access grade information as an alternative to quarterly report cards.	Spring, 1984 or Fall, 1984
Library Bibliographies, Internal For research purposes, students can use home computers to direct them to particular books and reference materials located in the district's two libraries.	Fall, 1984
Library Bibliographies, External Same as above, only including public and college libraries in the area.	Winter, 1984 or Spring, 1985
Student Assignments Students can receive assignments and turn in completed work from their home computers	Fall, 1985

(Continued from page 28)

puter to each individual user's micro.

Present Obstacles—and Future Possibilities

A school-to-home networking program such as this has one obvious drawback: Its success is based on the assumption that area families own home computers—not to mention modems. Sakamoto recognizes this problem, but remains optimistic. "Currently, 18 percent of the parents in our school district have micros," he says. "Plus, statistics indicate that, within five years, that figure will be more like 90 percent."

The district has also taken steps to make sure that families who don't have computers will still have access to this system. Of the 25 microcomputers that were originally donated by Atari for the project, at least four will be set aside in the Mountain View High School library, for overnight loans.

Obviously, a system like HSCN would not have been possible even a few years ago—and its existence today owes much to decreasing hardware prices. But what about the cost of the special networking program? Isn't it true that, while hardware prices are going down, software costs are escalating? According to Dean Brown, president of the Picodyne Corporation, which has been responsible for designing the software, installing the system, and serving as on-going consultants, that cliché holds little or no truth. He points out that a number of other school districts in the area have already expressed an interest in setting up their own projects of this type.

"Of course, this is still a trial period," says Sakamoto. "But if the system proves itself, I can't see why other districts wouldn't jump at it. In California alone, school guidance departments were hit hard by personnel and budget cuts resulting from Proposition 13. Our new system will never replace counselors, who are more important now than ever. But it can eliminate the drudgery work, and free up their time for more important tasks."

Even though the project's official debut isn't until this fall, Sakamoto looks forward to trouble-free operation. And if a problem should arise, Sakamoto is confident it will serve as a learning experience. "After all," he points out, "when I first got the idea for this system, I was sitting in my car in a hopelessly stalled, bumper-to-bumper traffic jam. So you see, something good can come out of even the most difficult tangles." EL

HOME-SCHOOL COMPUTER NETWORK AVAILABLE NOVEMBER 7

On November 7, the high school district will make the Home-School Computer Network (HSCN) available to students and parents. This system will enable the home to obtain counseling and guidance information from the school using telephone lines. Equipment required is a microcomputer, a computer monitor or television set, and a modem (device that allows computers to communicate with each other over telephone lines that can be purchased at most computer stores).

The HSCN was funded and developed through donations of money and/or equipment from the following: the Atari Educational Foundation, Sunnyvale; Picodyne Corporation, Ladera, California; Onyx Systems, San Jose; and Zysan Corporation, Sunnyvale.

The menu of information available by the HSCN will be the following:

1) Individual graduation and college entrance requirements -
   - A. Comparison of your student's academic record with graduation requirements.
   - B. Comparison of your student's academic record with the University of California entrance requirements.
   - C. Comparison of your student's academic record with the California State College and University system entrance requirements.
2) Student's Report Card - grades received previous grading period - not available until late November.
3) Student's Attendance Record - absences to date in each class - excused and unexcused.
4) Activity calendar - major school activities - date and time.

If you are interested in using the Home-School Network, please complete the form below and return it to the school's Counseling Office at your earliest convenience. Additional information will be sent to you regarding the following: 1) access telephone number, (2) system security, (3) student password, and (4) operating instructions.

- -

HOME-SCHOOL COMPUTER NETWORK

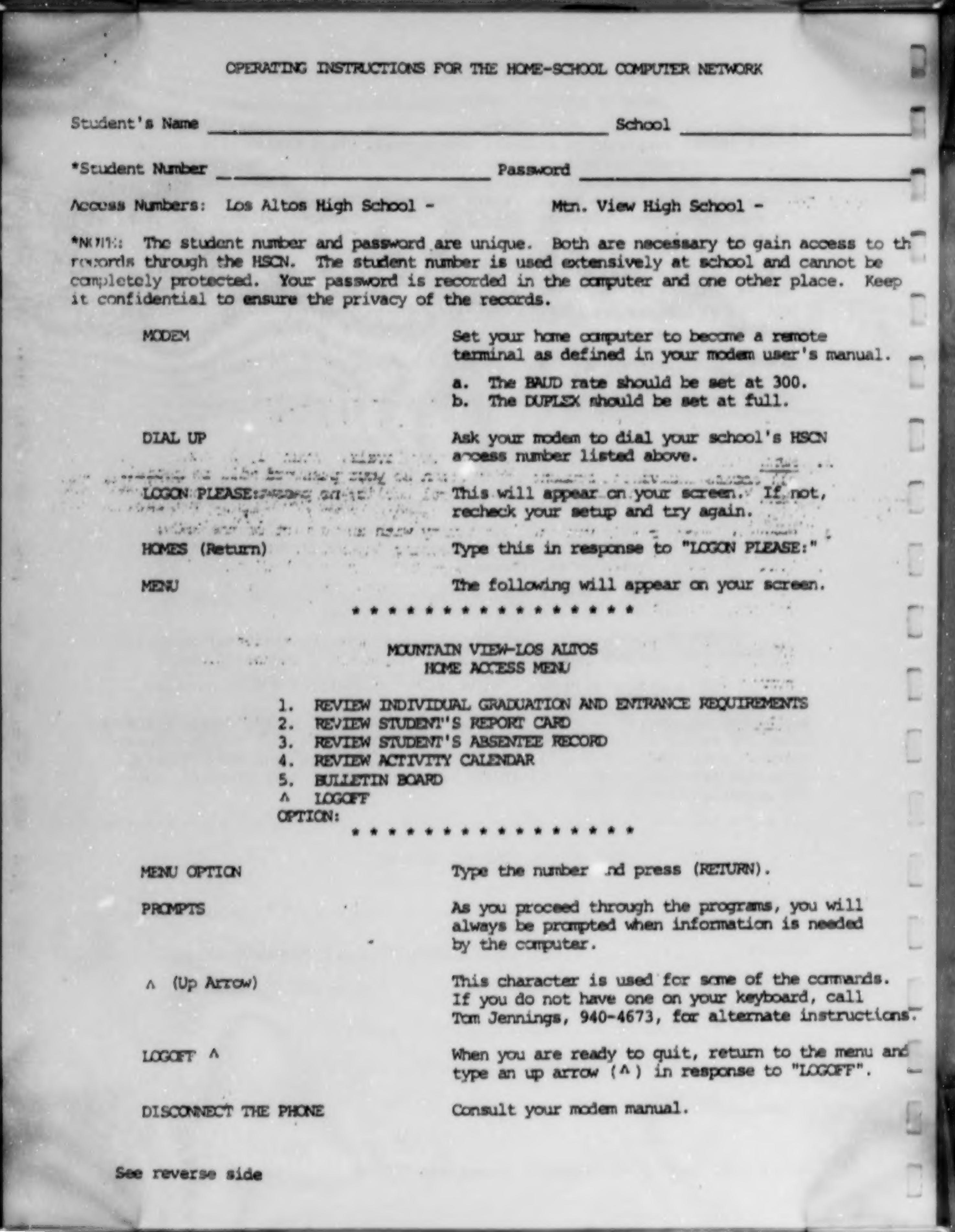
Parent Name .... Date ....

Address .... Phone No. ....

Name and grade level of your student(s) whose records will be accessed.

1. ....
2. ....
3. ....
4. ....

Return this form to the school's Counseling Office.



OPERATING INSTRUCTIONS FOR THE HOME-SCHOOL COMPUTER NETWORK

Student's Name ______________________________ School ________________

*Student Number ____________________ Password ______________________

Access Numbers: Los Altos High School - Mtn. View High School -

*NOTE: The student number and password are unique. Both are necessary to gain access to th records through the HSCN. The student number is used extensively at school and cannot be completely protected. Your password is recorded in the computer and one other place. Keep it confidential to ensure the privacy of the records.

MODEM	Set your home computer to become a remote terminal as defined in your modem user's manual. a. The BAUD rate should be set at 300. b. The DUPLEX should be set at full.
DIAL UP	Ask your modem to dial your school's HSCN access number listed above.
LOGON PLEASE:	This will appear on your screen. If not, recheck your setup and try again.
HOMES (Return)	Type this in response to "LOGON PLEASE:"
MENU	The following will appear on your screen.

* *

MOUNTAIN VIEW-LOS ALTOS
HOME ACCESS MENU

1. REVIEW INDIVIDUAL GRADUATION AND ENTRANCE REQUIREMENTS
2. REVIEW STUDENT'S REPORT CARD
3. REVIEW STUDENT'S ABSENTEE RECORD
4. REVIEW ACTIVITY CALENDAR
5. BULLETIN BOARD

^ LOGOFF

OPTION:

* *

MENU OPTION	Type the number and press (RETURN).
PROMPTS	As you proceed through the programs, you will always be prompted when information is needed by the computer.
^ (Up Arrow)	This character is used for some of the commands. If you do not have one on your keyboard, call Tom Jennings, 940-4673, for alternate instructions.
LOGOFF ^	When you are ready to quit, return to the menu and type an up arrow (^) in response to "LOGOFF".
DISCONNECT THE PHONE	Consult your modem manual.

See reverse side

INFORMATION FOR THE HOME-SCHOOL COMPUTER NETWORK

GENERAL INFORMATION:

1. HSCN EQUIPMENT - When you log on (see OPERATING INSTRUCTIONS), you will be accessing an Onyx computer located at the high school which serves your student. This computer has four (4) access lines and there may be contention for these at times. Multiple telephone lines are served by one number.

2. HSCN Schedule - Parents and students may dial into the system Monday, Tuesday, Thursday, and Friday from 8:30 p.m. until 7:00 a.m. the following day and on weekends from 3:30 p.m. on Saturday until 7:00 a.m. Monday. On Wednesdays, the system will be used exclusively by the school.

3. Menu - Note that the menu has two security levels. Items 1, 2, and 3 all access individual student information so your password will be needed. Menu item 4 and 5 are open to the general public; no password is needed.

4. Trouble Shooting - If you have difficulty with any aspect of the HSCN, please contact Tom Jennings, Data Processing Supervisor, at the high school district office, 940-4673 between 8:00 a.m. and 5:00 p.m. If Tom is not available, leave a message describing the problem and a telephone number where you can be reached.

5. Security - The system has an internal security measure to detect tampering. Also, you may note that after three tries at the student number or password, you are returned to the menu.

6. Modifications - Please feel free to contact Milt Schmidt, Director of Pupil Personnel, at 940-4651 or Tom Jennings if you have suggestions for improving the system as it currently exists.

See reverse side for operating instructions

MOUNTAIN VIEW-LOS ALTOS UNION HIGH SCHOOL DISTRICT

Registrar's Menu

1. Print Master Course List
2. Develop Student Career Goals
3. Print Student Directory
4. Develop Student Schedules
5. Printout Individual Locators
6. Print Student Labels
7. Develop Student Information
8. Determine Student Activity
9. List Students Without Schedules
10. Make Class Lists
11. Printout Schedules For All Students
12. Determine Form Length
13. Print Student Locator
14. Print Waiting Lists
15. Verify Data Base
16. Print Permanent Locators
17. List Student W/O Competency Test Results
18. Enter Grades Current Courses
19. Enter Grades Historial Files
20. Schedule Students This Semester
21. Schedule Students This Semester Status Only
22. Enter Or Modify Historical Files
23. Print Tally Summary
24. List Students By Counselor
25. Print Student Report Cards
26. Print Student Transcript Labels
27. Print Dean's List
28. Print Athletic Ineligibility Report
29. List Students on Honor Roll
30. Print Emergency Contact Report
31. Print Emergency Labels
32. Printout Of Student Number/Name Only
33. Printout Feeder School GPA Summary
34. Printout College Bound Ethnic Summary
35. Print GPA Summary Grade Level
36. Print GPA Summary Ethnic Group
37. Printout Grd. Lvl/Sex/Ethnic Summary
38. Grade Distribution Ethnic Group
39. Printout Dept/Grade Distribution
40. Printout Teacher Grade Distribution
42. Print Indiv. Class Ethnic/Grd. Lvl. District Report
43. List Student W/O Responses For Career Plans
44. Print Pupil Vocational Listing
45. Enter All Test Scores
46. Develop Current Schedules

Counselor's Menu

1. Develop Proposed Course List
2. Develop Student Career Goals
3. Develop Current Schedules

Vice Principal's Menu

1. Develop Master Course List
2. Determine Course Activity
3. Enter U. C. Equivalents
4. State Equivalents for CBEDS
5. Print Master Course LIst
6. Enter A Student Into A Full Course N
7. Enter A Student Inter A Full Course T
8. Develop Student Schedule
9. List Of Courses By Room Number
10. List Of Courses By Teacher
11. Develop Student Demographics
12. Determine Student Activity
13. List Students Without Schedules
14. Printout Class Lists
15. Printout Schedules For All Students
16. Develop Current Schedules

Attendance Clerk's Menu

1. Post Absences By Hand
2. Convert Unexcused to Excused Absences
3. Set Flag For Weekly Or Tri-Weekly Report
4. Print Attendance Report To Parents
5. Print 20% Attendance Report
6. Print 4 Or More Absence Report
7. Print End of Semester Average Report
8. Print Attendance Averages Report
9. Print Attendance Ethnic Summary
10. Read In Scantron Sheets
11. Print Scantron Sheets
12. Print Daily Report
13. Print List Of Teachers Not Returning APL's
14. PREPARE FILE TO PRINT APL's
15. END OF WEEK ROUTINE

Counseling Clerk's Menu

1. Print Master Course List
2. Develop Student Career Goals
3. Print Student Directory
4. Develop Student Schedule
5. Printout Individual Locators
6. Print Student Labels
7. Develop Student Information
8. Determine Student Activity
9. List Students Without Schedules
10. Make Class Lists
11. Printout Schedules For All Students
12. Determine Form Length
13. Print Student Locator
14. Print Waiting Lists
15. Develop Master Course List
16. Print Permanent Locators
17. List Of Courses By Room Number
18. List of Courses By Teacher
19. Develop Current Schedules

ANNEXE IV

Documentation sur Mountain View-Los Altos
Union High School District
Collaboration avec Picodyne Corporation

The Project

The Home-School Computer Network project is a joint venture of the Atari Institute for Educational Action Research, Picodyne Corporation, and the Mountain View-Los Altos Union High School District. This network will make it possible for parents to have access to important school counseling and guidance information about their youngsters. This project is based on the assumption that about 90 percent of our residents will have home computers in the next decade. The second assumption is that parents will be in a better position to assist their youngsters in school if more information were available to them. The third assumption is that school counselors will be able to spend more time interacting with students on a personal level if the routine tasks of guidance were mechanized.

The System

The system calls for a central microcomputer which will store pupil personnel records and guidance information. Attached to the central computer will be a high-speed printer to provide copies of records as needed. Each counselor's office will have a microcomputer which will be linked to this central system. Counselors will be able to develop and change student schedules and call up pupil personnel information, e.g., transcript, master class schedule and enrollments, attendance records, etc. Parents may, by telephone, have access to their youngsters' school guidance records. The expansion of the system is only limited by the imagination and creativity of those who use the system. The counseling-guidance program is only one phase. The library, the classrooms, and the departments are other phases which could provide the home with valuable school information.

The Information

A parent dialing in will be presented with a "menu." This menu will consist of a list of categories of information such as college entrance, graduation requirements, financial aid scholarships, career guidance, and the school's curriculum. The parent may then select the particular category as it relates to his/her youngster. Information will be basically of two types. One will be of the recall nature, and the other will call for an analysis. The recall type will be straight information giving, e.g., transcript, attendance, course information, etc. The analysis type will call for a review of that particular student's records against a given standard, e.g., graduation requirements, college entrance, financial aid scholarships, college selection, etc. For example, in the area of college entrance requirements, the computer will be programmed to make an analysis of the student's academic record for entrance to the University of California. The analysis will report the courses which have been completed or must be taken in order to meet the admission requirement and the grade point needed in these classes. Such an analysis will be available after each semester so the student whose goal is to enter the University of California system may have an up-to-date report on his/her progress toward meeting the requirements.

The Funding

The Atari Institute for Educational Action Research has made donations of $60,000 and the Atari hardware needed to implement the system. Picodyne Corporation, a designer of customized computer systems, is responsible for the installation of equipment and the software design. The Mountain View-Los Altos Union High School District staff will work with Picodyne in program design and data input.

The Timeline

Current projected timeline calls for the testing of the system at each school site in the spring of 1983. The counseling and guidance phase of the system should be operational in the fall of 1983.

The Principal Collaborators

Yolanda Jenkins, (Acting) Executive Director, Atari Institute for Educational Action Research, 1196 Borregas Avenue, Sunnyvale, CA 94086, (408) 745-2666
Dean Brown, President, Picodyne Corporation, 3000 Alpine Road, Ladera, CA 94026, (415) 854-3088
Paul Sakamoto, Superintendent, Mountain View-Los Altos Union High School District, 1299 Bryant Avenue, Mountain View, CA 94040, (415) 940-4650

ANNEXE V

Documentation sur Mountain View-Los Altos

Union High School District

. Présentation du réseau: High School

et ordinateurs familiaux

MOUNTAIN VIEW-LOS ALTOS UNION HIGH SCHOOL DISTRICT

STUDENT ATTENDANCE AND BEHAVIOR

Students have the same legal rights and responsibilities as any other person, subject to their status as minors. Students have the right to an education, and to due process under the law. Students have the responsibility to learn, and to allow other students to learn. The behavior guidelines presented here have been formulated to establish and maintain a proper learning environment for all students.

I. STUDENT RESPONSIBILITIES

A. Primary Responsibilities. All students are expected to:

1. Value an education.
2. Attend school and classes daily.
3. Know the school rules.
4. Respect the rights and property of others.
5. Not endanger the physical well-being of others.
6. Allow others to reach their educational goals.
7. Accept the consequences when they disobey school rules.
8. Use an orderly process of appeal when they feel they have been dealt with unfairly.

B. Appeal Process. If a student disagrees with a disciplinary action taken by a teacher or school official, he/she should first comply with the request and then follow these appeal steps:

1. Discuss the matter after class.
2. If still not satisfied, the student may involve his/her counselor, a parent, or the dean.
3. If still not satisfied, the student may go to the principal.
4. The next step is to appeal to the district administration.

The school's student board of appeals is another avenue available to students.

II. SCHOOL AND CLASS ATTENDANCE

A. Attendance and Tardy Policy. Students who are absent or tardy excessively will be dropped from class or school. A student will be dropped from class in any of the following instances:

1. After four (4) unexcused absences (cuts) during a semester.
2. After fifteen (15) total absences for any reason during a semester.
3. After twelve (12) tardies during a semester.

Parents and students will be warned of the consequences as absences and tardies accumulate.

B. Absences. Absences must be verified by school officials. Parents must call the school attendance office as early as possible prior to or on the day of an absence. Notes will be accepted only when there is no telephone available.

1. Excused Absences. Illness, quarantine, health appointments (medical, dental, optometrical), religious holiday observances, death in the immediate family, or serving on a jury are the only legal reasons to be absent from school. School initiated activities such as field trips, athletic contests and counseling appointments which cause a student to miss a class are also considered "excused absences."
2. Unexcused Absences. "Cuts," recreational activities such as ski trips, or other absences not classified as "excused" in the paragraph above are designated as "unexcused absences."

III. JURISDICTION OF THE SCHOOL

A. Education Code Section 48900 specifies those acts for which disciplinary action may be taken and prescribes the school's jurisdiction or area of authority in matters of school attendance or activity as the following: (1) while on school grounds, (2) while going to or coming from school, (3) during lunch period on or off campus, (4) at school activities whether on or off campus, or (5) during, or while going to or returning to school from, a school sponsored activity.

IV. MAINTAINING AN ORDERLY CLASSROOM AND CAMPUS ENVIRONMENT

A. Classroom Courtesy. Students are expected to be courteous and responsible in the classroom. Each teacher will discuss standards of classroom behavior the first week of school.

B. Suspension From Class. Teachers may suspend from class, for up to two class days, any student who disrupts instruction. A suspended student must report to the dean's office. Continued disruption of class may lead to suspension from school by the administration.

C. Proper Campus Behavior.

1. Smoking Area. School board policy allows designated smoking areas on campus. Students are permitted to smoke in these areas only; violators will be subject to disciplinary action.
2. Lockers. Students should not leave anything of value in their lockers overnight. Books or personal property stored in school lockers are the responsibility of the student.

C. Proper Campus Behavior (Continued)

3. Books. Each student assumes financial responsibility for books issued to him/her. Losing, damaging or defacing books will result in a charge to the student.
4. Registration of Motor Vehicles. All motorized vehicles brought on the school campus must be registered in the dean's office and have the parking sticker displayed in the appropriate place. All students must park in the student lot only.
5. In the Cafeteria. Students must deposit trash in the garbage cans. Throwing of food and cutting in line will result in disciplinary action.
6. Food in Class. Eating and drinking are not allowed in the library, offices, or in the gymnasium, or in a classroom without teacher supervision.
7. Frisbees, Balls, or Other Thrown Objects. No objects should be thrown in the quad or around any buildings where they may land on the roof, break windows, or possibly injure someone.
8. Off-Limit Areas. The parking lots and certain designated areas of the campus are off limits to all students during class time. Students should not loiter in the parking lots at any time.
9. Public Displays of Affection. Students are asked to refrain from inappropriate displays of affection.
10. Bicycles, Skateboards, Roller Skates, and Mopeds. These items are not to be ridden on the school grounds or brought into the hallways or corridors. There are designated bicycle routes and parking areas on campus. The school assumes no responsibility for stolen or damaged bicycles.
11. Visitors. All visitors must register in the dean's office. Requests for social visits by nonstudents will be denied. Violators can be arrested.

D. Disciplinary Actions.

1. Suspension from School Activities. In any case where disciplinary action has been taken, the student may be suspended from school activities as a participant or an observer for the duration of the disciplinary action. Suspension from school activities may also be assigned as a primary disciplinary action. Such action may be taken for severe violations, continuation of the initial problem, or if additional problems develop for which a student is held responsible.
2. Other Disciplinary Actions. The following actions may be taken by the administration: (1) work on campus, (2) detention before or after school, (3) payment for willful acts such as theft, vandalism, or damage to property, and (4) suspension from school.

E. Behaviors Leading to School Suspension and Possible Expulsion. There are certain acts that are considered serious enough that the student may be suspended from school immediately; the police may be involved; and expulsion may result. These include:

E. Behaviors Leading to School Suspension and Possible Expulsion. (Continued)

1. Fighting. All forms of fighting or conspiracies to engage in fighting are strictly prohibited. Included in the above are:
    a) fighting on any school grounds, in school vehicles, or at any school-sponsored activity.
    b) fights initiated at school but taking place elsewhere.
    c) causing, attempting to cause, or threatening to cause physical injury to another person.
2. Threats to adults or students.
3. Dangerous instruments on campus, e.g., knives, fireworks, clubs, etc.
4. Destruction of school or individual property (parents/guardians are liable for damages to school property caused by minors).
5. Use, possession, or sale of alcohol, narcotics, other dangerous drugs, or stimulants.
6. Theft or possession of stolen property.
7. Continued willful disobedience or defiance of authority.
8. Name-calling. Willful and malicious slurs of ethnic groups or individuals will not be tolerated.

F. Other Unacceptable Behavior

1. Disruptive Behavior. Disruptive, insubordinate, or rude behavior will not be permitted at any time.
2. Obscene or Vulgar Language. Use of obscene or vulgar language in any form will not be tolerated.
3. Disruptive Audio Equipment. Radios, tape decks, and walkman types of equipment are not allowed on campus.
4. Disruption of Instruction. Students are not to congregate or loiter around classrooms or other areas where classes are in session.
5. Inappropriate Dress. Students are expected to wear clothing appropriate for school. Students must wear shoes at all times for safety reasons.

The following education code sections apply to the above:

Education Code Sections 12101, 46600-48819, 48900-48923
California Administrative Code, Title 5, Section 200-299, 300-307, 400-427.

ANNEXE VI

Documentation sur l'utilisation de l'informatique au Collège de San Mateo (liste des modules informatisés dans l'enseignement des mathématiques)

COMPUTER ASSISTED INSTRUCTION MODULES
FOR VOCATIONAL STUDENTS

ADDSUB	Addition and subtraction of signed numbers
ADFRAC	Addition and subtraction of fractions
COMPRA	Comparison of fractions
CUTSP	Determination of rim speed, RPM, and circumference of rotating circular tools
DCOHMS	Ohms Law in a dc circuit
DCPOWR	Power in a dc circuit
DIVDEC	Division of decimals
GEARS	Gears and gear ratios
LCD	Determination of the least common denominator of two or three fractions
MIXFRA	Conversion of improper fractions to mixed numbers and conversely
MULFRA	Multiplication and division of fractions
ORDOP	Order of operations with whole numbers
ORDOP2	Advanced treatment of the order of operations with whole numbers
PCT	Conversion of percents to decimals and decimals to percents
PRD	Powers and square roots of decimals
PRIFAC	Recognition of prime numbers and factorization of composite numbers
PROP	Ratio and proportion
QUAD	Factorization of quadratics
REFRA	Reduction and expansion of fractions
ROFF1	Rounding off numbers
TRIANG	Solution of right triangles
TRIG	Sine, Cosine, and Tangent in right triangles
WNE	Whole number exponents
WNE2	Advanced treatment of whole number exponents

DB	Pre-test on decibels
DB*	Decibel calculations for amplifiers and attenuators
DIVAPL	Application of voltage dividers
DIVPOT	Potentiometers as simple dividers
IMPED	Impedance and phase angles in AC circuits
LOG	Pre-test on logarithms
LOG*	Theory of logarithms
LOG**	Post-test on logarithms and decibels
OHMS	Resistance in series, parallel, and series-parallel DC circuits
POTAP1	Potentiometers
POTAP2	Multiple potentiometers
VOLDIV	Voltage dividers
WTBAL	Center of gravity of single-engine aircraft
AHMCON	Comparison of the Apothecaries system of measurement with the household and metric systems (for Nursing Program)
APYCON	Provides an explanation of the Apothecaries system of measurement
CAPAC1	Capacitance in series or parallel circuits
COMSOL	Provides practice in the preparation of medical solutions from other solutions
HT/CAL	Determines the correct exposure times for a main, flash, and bump exposure for a given highlight density, shadow density, and reduction or enlargement of an original copy or photograph
METCON	Conversion from metric to English system and conversely
PRESOL	Dilution of a pure substance to obtain a desired solution
REDDBM	Real estate application - declining balance of depreciation
REDPCN	Real estate application - depreciation using the straight-line, units of production, sum of the years' digits, and 200% declining balance methods

ANNEXE VII

Documentation sur le MCEP

MCEP

THE MATH AND COMPUTER EDUCATION PROJECT

Lawrence Hall of Science
University of California, Berkeley

The Lawrence Hall of Science is a participatory science museum and research center affiliated with the University of California, Berkeley. Educational groups at the Hall seek ways to increase appreciation and participation in science by people of all ages. The *Math and Computer Education Project (MCEP)* has been involved in computer education for more than ten years. The specific goals of this Project are:

1. To provide participatory experience with computer technology.
2. To increase computer awareness and literacy among the general public, students, educators, and special interest groups.
3. To facilitate the development of logical and creative thinking.

The evolution of program offerings in MCEP reflects attempts by the Project to meet the changing needs of children and adults in computer education. Rather than developing and using computer–assisted instruction to teach reading, writing, and arithmetic, MCEP has elected to focus students' attention on how a computer works, what languages it speaks, and how it can be used in art, science, music, mathematics, English, and other disciplines.

CURRENT PROGRAMS AND PROJECTS

Over 250,000 people visit the Lawrence Hall of Science each year and 40,000 of these people participate in computer–related classes and programs.

Classes

Nearly 1,000 people enroll each summer in one or more of the five two–week sessions that are offered at the Hall. Every fall, winter, and spring, approximately 20 after–school classes are offered. Each of these courses provides students with 12 hours of instruction and hands–on computer experience. The courses range in topic from *Creative Play*, a problem–solving computer course for young children, to *Art and the Computer*, a class that allows students to investigate the computer as a medium for art. *Ms. Math* is a class that combines mathematical problem solving with an introduction to computers. This course was developed to encourage young girls to participate in computer classes. *Micros for Micros* was developed to involve kindergarten children with computers. In addition, programming and word processing courses for adults as well as a microprocessor course for scientists are offered to meet the ever–growing demand for continuing education.

Workshops

During the academic year, thousands of school children come to the Hall with their teachers for a brief introduction to computers. This introduction may take one of several forms: beginning programming, educational games, or an introduction to color graphics. MCEP also conducts computer literacy workshops for a variety of special interest groups in business, education, and industry.

Teacher Inservice

As computers wend their way into schools, teachers are beginning to look for ways to integrate them into the curriculum. MCEP has developed a program for teachers that exposes them to computer hardware, history, word processing, programming, use of software, and software review techniques.

Courseware

MCEP has published and is distributing courseware for two of its most popular classes, Creative Play and Beginning BASIC. In addition, a development effort has been initiated to produce a cohesive software package for the elementary grades.

MCEP

DIRECTIONS FOR THE FUTURE

In the future, MCEP will not only continue to offer a variety of courses to increase public understanding of science and computer technology, but also attempt to provide some substantive materials and guidelines for the effective use of computers in the classroom.

Further information is available from:

Math and Computer Education Project
Lawrence Hall of Science
University of California
Berkeley, CA 94720
(415) 642-3167

LAWRENCE HALL OF SCIENCE
MATH AND COMPUTER EDUCATION PROJECT
UNIVERSITY OF CALIFORNIA
BERKELEY, CA. 94720

LEARNING ABOUT SOFTWARE

Periodicals. These contain software reviews in each issue.

*Classroom Computer Learning
5615 West Cermak Rd.
Cicero, IL 60650

$19.95/year
9 monthly issues

The Computing Teacher
University of Oregon
1787 Agate St.
Eugene, OR 97403

$21.50/year
9 monthly issues

*Curriculum Product Review
19 Davis Drive
Belmont, CA 94002

Available at no charge to educational purchasing agents.
9 monthly issues.

Curriculum Review
517 S. Jefferson St.
Chicago, IL 60607

$35/year
5 issues per year

Electronic Learning
730 Broadway
New York, NY 10003-9538

$19/year
8 monthly issues

*Part of Learning Periodicals Group which sponsors an annual Award for Excellence in Educational Software for Microcomputers.

Software Catalogs and Directories

Classroom Computer Learning Directory
of Educational Computing Resources
5615 West Carmel Rd.
Cicero, IL 60650

$9.95 each
Part A-Directory of Educational Computing Resources and
Part B-Directory of Educational Software

Instructor Computer Directory for Schools
757 Third Ave.
New York, NY 10017

$19.95

Whole Earth Software Review
150 Gate 5 Rd.
Sausalito, CA 94965

$5 release date 2/14/84

Books

Lathrop, Ann and Goodson, Bobby Courseware in the Classroom: Selecting, Organizing, and Using Educational Software Addison-Wesley, Menlo Park, CA 1983. $7.95

Preview Centers in the Bay Area

Educational Media Services
Resource Center
2371 Stanwell Drive
Concord, CA 94520
(415) 671-4316
Affiliation: Contra Costa Co. Office of Education
Contact: John Jegi

Hardware: Apple II+, IIe
Commodore 64, PET,
TRS80 Model III,
IBM PC
Inventory: 4000 programs
(3000 public domain);
management, administrative;
MECC

TECC Center
313 West Winton Ave.
Hayward, CA 94544
(415) 887-0152
Affiliation: Alameda County School District
Contact: Karen Huerta

Hardware: Apple II, IIe,
Atari 800,
Commodore 64, PET
TRS80 Model III,
IBM PC
Inventory: 160 commercial prgrms
over 1000 public domain
management

TECC Center
P.O. Box 4925
1111 Las Gallinas
San Rafael, CA 94913
(415) 499-5877
Affiliation: Marin County
Office of Education
Contact: Carol Cooper

Hardware: Apple IIe
Atari 800
TRS80 Model I, III
IBM PC
Commodore PET, VIC 20
Inventory: 175 programs

TECC Center
Parkside School
2550 25th Ave.
San Francisco, CA 94116
(415) 664-8900
Affiliation: San Francisco Unified
School District
Note: Parents welcome
Contact: Dan Gourley

Hardware: Apple II+, IIe,
Atari 800,
TRS80 Model IV, Color Computer
Commodore 64,
TI-99/4A,
Timex-Sinclair
Inventory: 400 programs,
most academic subjects,
management, administrative

TECC Center/Software Library and Clearinghouse
333 Main St.
Redwood City, CA 94063
(415) 363-5400
Affiliation: San Mateo County Office of Education
Note: by appointment only.
Contact: Ann Lathrop

Hardware: Apple II+, IIe
Atari 400, 800
Commodore 64, VIC 20
TRS80 Model I, III, Color Comp
TI-99/4A
Inventory: over 1,000 programs

Technology Learning Center/Far West Laboratory
1855 Folsom St.
San Francisco, CA 94103
(415) 565-3000
Contact: Kendra Bonnett

Hardware: Apple II, IIe,
Commodore 64, VIC 20,
Atari 400
TI-99/4A
Inventory: 70-80 programs

rom the Lawrence Hall of Science's Award
Winning Math & Computer Education Project...

Micros for Micros...

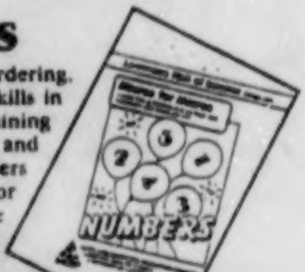
by Linda Lipner and Twila Slesnick, Ph.D.

- **Especially for 4-6 year olds and their adults.**
- **Features computer programs and noncomputer activities.**
- **Ideal for both home and school.**

This innovative, four unit series provides a lively introduction to computer use while also developing basic learning skills in math, music, estimating, and reading. Each unit features colorful graphics programs on the computer, complemented by complete instructions for intriguing noncomputer activities. ***Micros for Micros*** is now available for Apple®II, IIe, and II + microcomputers (48K memory, Applesoft BASIC). ***Choose from:***

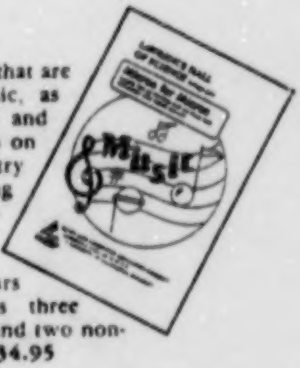
NUMBERS

Practice sorting, ordering, logic, and counting skills in a variety of entertaining ways! Pop balloons and uncover secret numbers on the computer, or learn to recognize numerals with your eyes closed. Includes two computer programs and three noncomputer activities. **$34.95**



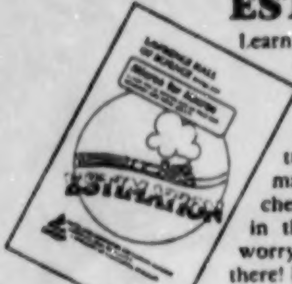
MUSIC

Explore the patterns that are fundamental to music, as well as mathematics and science. Create songs on the computer or try your hand at putting together "note sandwiches." Even make your own musical instruments using jars and water. Includes three computer programs and two noncomputer activities. **$34.95**



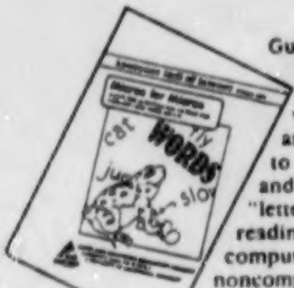
ESTIMATION

Learn to make quick approximations of distance, speed, quantity, and length. Locate the train in the computer's tunnel, or guess how many trucks fit in the toy chest. You'll even find bugs in the computer--but don't worry, they're supposed to be there! Includes three computer programs and four noncomputer activities **$34.95**



WORDS

Guess the computer's hidden words, or create sentences and watch the computer animate them. Learning to recognize the curves and lines that adults call "letters" is an essential basic reading skill. Includes three computer programs and four noncomputer activities. **$34.95**



FOUR UNIT SET: The Complete ***Micros for Micros*** Series—
NUMBERS, MUSIC, ESTIMATION, and WORDS—at a special price! **$134.95**

ORDER FROM:

Dealer terms available upon request.

Math and Computer Education Project
Lawrence Hall of Science
University of California
Berkeley, CA 94720
(415) 642-3167

MCEP

ANNEXE VIII

Documentation sur Computer Literacy

Slicing Through Spaghetti Code

by
Arthur Luehrmann
Computer Literacy
1466 Grizzly Peak Blvd.
Berkeley, CA 94708

(This article may be reprinted provided credit is given.)

BACKGROUND

Why is it that learning to program is so easy and so hard at the same time? Most of us taught ourselves, and it came fairly easily. Young children learn the spelling and grammar rules of BASIC or Logo in a few days. Sooner or later, though, we all discover a sad truth—no matter how clever we become at piling statement upon statement and making our programs work, the job never seems to get any easier. A long program (especially one written in BASIC) always seems to be disproportionately more complex and harder to write than a short one. And as we hack away at a tough problem we begin to feel the need for some general strategies for managing the complexities. If we are teachers, we feel the need to tell our students reliable, general rules for designing programs, which is more than just hammering them together, patching the holes, and then patching the patches.

Although it is a carefully guarded secret (almost never revealed in BASIC manuals), reliable, general strategies do exist for designing programs that work right the first time, are easy to read, and easy to change. These rules, sometimes grouped under the heading "structured programming," came out a lot of deep thinking in the late 60s by Dijkstra, Hoare, Wirth and other computer scientists. In fact, the Pascal language, defined in 1970, was mainly an attempt to build the ideas of structured programming into the very grammar of the language.

Alas, nearly all of that thinking has been securely locked away in universities and professional journals, which was all right, I suppose, as long as BASIC was viewed as a sort of toy language that no one would take seriously. Today the situation is different. Today more people know BASIC than any other programming language. Nearly every computer built and sold this year will have BASIC as its main language. Literally, millions of students, grades 3 to senior citizen, are learning about computers through BASIC.

This last fact was on the top of my mind when I left the comforts of academic in 1981 and joined forces with Herbert Peckham, who also left his college post. We began to think about the implications of the national move towards education for computer literacy. It was obvious that, no matter what anyone did, school teachers by the tens of thousands would be teaching something about computers to students by the millions. But what would they teach?

Trying to answer that question has been our full-time job for the last two years. Working under the assumption that most schools would have BASIC-speaking micros, that many students would have access to BASIC-speaking micros after school, and that most computer teachers would know BASIC better than other languages, we decided to see whether it was possible, within BASIC, to teach the powerful ideas of computing, which in the end are vastly more important than the details of the language used. We think the answer is a resounding yes, and we have put our ideas into the practical form of a school textbook, *Computer Literacy—A Hands-On Approach*, recently published by McGraw Hill.

> ***"A student's computer program is a written record of his or her thinking about the problem at hand. If the thinking is confused, awkwardly expressed, or redundant (not to mention illogical or flat out wrong), the job of the teacher is to notice these things, point them out and suggest a clearer way of thinking about the problem and writing it down."***

High on our list of priorities was that students learn those reliable, general rules for handling the complexities of a programming problem. And so we built into the textbook from the start a strict adherence to the principles of structured programming—in BASIC.

What Makes a Program Complex?

Complexity is the bane of programming. The more complex a program listing appears, the harder the program is to understand, to debug and to change. A student has a hard time getting the program to work. A teacher has a hard time reading and critiquing it. Some teachers just give up on complex programs and judge them entirely by the way they *behave* (or fail to behave) when run.

Educationally, this is a disastrous situation. A student's computer program is a written record of his or her thinking about the problem at hand. If the thinking is confused, awkwardly expressed, or redundant (not to mention illogical or flat out wrong), the job of the teacher is to notice these things, point them out and suggest a clearer way of thinking about the problem and writing it down.

English teachers do exactly that when they read student papers. Computer teachers can learn a lot from English teachers. They should be ready to say, "Janie, I don't care whether the computer understands this mess. Rewrite it so I can read it."

Of course, English teachers have a tremendous advantage. Long before students write papers, they are taught how to spell, how to write a sentence and how to build a paragraph. If there were no rules for spelling, no standards for writing a good sentence, and no models for putting words and sentences together into meaningful paragraphs, then the English teacher would not have a hope of being able to read and criticize a whole paper.

> ***"Computer teachers can learn a lot from English teachers. They should be ready to say, 'Janie, I don't care whether the computer understands this mess. Rewrite it so I can read it.'"***

Yet, computer teachers are precisely in that hypothetical situation. Students often try to write long programs, but they don't know how to organize statements into meaningful units, or how to combine smaller units into larger ones. They try to build a program by stacking one statement on top of another and, like a house of cards, the whole thing usually falls down in a scrambled heap.

It need not be thus. Our experience convinces us that, even with BASIC, a teacher can show beginning students a systematic way to think about computer problems and to write those thoughts into a computer program.

How to Make Spaghetti

Before looking at the systematic approach just referred to, let's see how most beginning programmers go about their jobs and how they get into trouble. (The author feels compelled to confess here that his ow proach to programming was, for most of his years the computer, no better than the description that no follows. There, but for the grace of God, and teachers. . .)

Let's suppose that your student, Edsger, has writt BASIC program—a game, and it starts with line 10 You try running it and find that it needs instruction you say, "Ed, how about giving some instructions a beginning." Ed accommodates as follows:

```
50 PRINT "HERE ARE THE INSTRUCTIONS"
52 PRINT ". . .
•
•
•
etc.
```

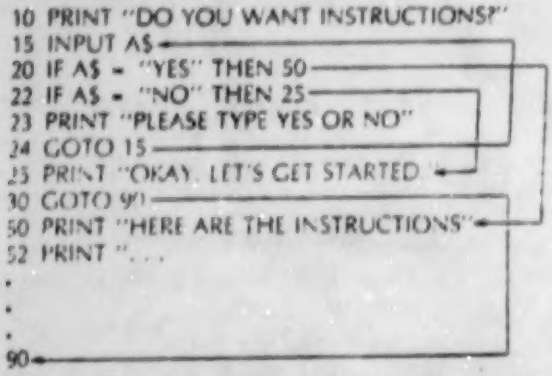
But Ed is not satisfied. Once a player knows the rule there's no need to print them every time s/he run program. So Ed changes the program as follows:

```
10 PRINT "DO YOU WANT INSTRUCTIONS?"
15 INPUT A$
20 IF A$= "YES" THEN 50
25 PRINT "OKAY. LET'S GET STARTED."
30 GOTO 90
50 PRINT "HERE ARE THE INSTRUCTIONS"
52 PRINT ". . .
•
•
•
90
```

This improves the program and seems to work ju fine until Ed's friend Ada runs the program and ans the question in line 10 by typing "SURE." She is unhappy when the program launches into the ga without giving her any instructions. Ed now realiz that he has to expect answers other than "YES" "NO." He resolves the problem by adding lines 22 as follows:

```
10 PRINT "DO YOU WANT INSTRUCTIONS?"
15 INPUT A$
20 IF A$ = "YES" THEN 50
22 IF A$ = "NO" THEN 25
23 PRINT "PLEASE TYPE YES OR NO"
24 GOTO 15
25 PRINT "OKAY. LET'S GET STARTED."
30 GOTO 90
50 PRINT "HERE ARE THE INSTRUCTIONS"
52 PRINT ".
•
•
•
90
```

Now Ed's program insists on a "YES" or "N answer and prompts the user if anything else is enter This is good user engineering (better than on so commercially available programs, by the way), and deserves credit for the way it works. But he doe deserve any strokes for the way it reads. To show what a mess of spaghetti Ed has cooked up for us, here is the same program segment with arrows drawn for all of the nonsequential jumps of program control:



```
10 PRINT "DO YOU WANT INSTRUCTIONS?"
15 INPUT A$
20 IF A$ = "YES" THEN 50
22 IF A$ = "NO" THEN 25
23 PRINT "PLEASE TYPE YES OR NO"
24 GOTO 15
25 PRINT "OKAY, LET'S GET STARTED"
30 GOTO 90
50 PRINT "HERE ARE THE INSTRUCTIONS"
52 PRINT ". . .
.
.
.
90
```

You, as readers of this paper, have the advantage of knowing what Ed was up to at each stage of the program's development. But if Ed simply handed this listing to you, you would need to read it pretty carefully to find out what he was trying to do and whether he had succeeded. You would have to look at every line from line 10 to line 90, since the jump arrows span that whole space. There seems to be no way to divide that block into more manageable chunks.

If Ed can produce this much spaghetti in just 10 lines, think what he could do with a 100-line program! His lack of a systematic method of thinking and writing would mean that you, poor teacher, would have to pore over every line in order to figure out what he was trying to do. You would probably be very hard pressed if asked to judge such a program or suggest improvements. And Ed would also be hard pressed if you asked him to add a new feature to the program.

Where Does Complexity Come From?

Here is a basic mathematical fact: If every statement in a program is allowed to be the target of a jump arrow, the resulting complexity grows as the square of the length of the program. A program that is three times as long as another, for example, is *nine* times harder to read and comprehend. This fact explains everyone's experience with long programs.

The way out of this tangle, obviously, is to discipline the use of jump statements such as IF and GOTO in BASIC. For example, compare the complexity of each of these six-line programs:

```
10 LET A$ = "RED"        10 PRINT "RED"
20 PRINT A$              20 GOTO 50
30 LET B$ = "WHITE"      30 PRINT "WHITE"
40 PRINT B$              40 GOTO 10
50 LET C$ = "BLUE"       50 PRINT "BLUE"
60 PRINT C$              60 GOTO 30
```

The one on the left is a *straight sequence of simple actions*. The computer performs each action and then goes on to the next one in the list. But the program on the right is a mixture of *actions* and *jumps*. You have to read the *whole* program to discover that its structure is an infinite loop. At the single-statement level, both programs have the same complexity; but as a whole structure, the one on the left is simpler.

The solution to the problem of complexity, then, seems simple—always make your program into a straight sequence of actions. With a language such as BASIC, that may at first seem impossible to do. After all, the statements on the left below are the *only* ones that perform simple actions:

Action Statements		Control Statements	
Input:	INPUT	Loop:	FOR/NEXT
Processing:	LET	Decision:	IF THEN ON GOTO
Output:	PRINT graphics sound	Jump:	GOTO GOSUB RETURN
		Halt:	STOP END

Without the *control* statements on the right, it would be impossible to write a BASIC program to tell the computer to repeat some action again and again or to choose between two alternative actions. Most programming problems could not be solved without such loops and branches.

One way out of this dilemma is to use a language such as Pascal, which has no need of GOTO statements and the like. This idea flounders on the fact that of the 200,000 computers in schools today, all offer BASIC and only a few thousand offer Pascal. Furthermore, the standard implementations of Pascal have no "immediate mode" and require that a beginner first master a fairly complex editor and operating system. Those hurdles are too high, in our judgement, for a practical introductory course in computing for junior high school students. (One happy exception is the Rascal interpreter by Charles Hughes and Michael Moshell, which is available as part of *Computer Power* through McGraw-Hill.[1]

One-in/One-out Blocks

In trying to avoid program complexity, we have stated a **goal**, discovered a sad **fact**, and are now left with a new **problem**:

GOAL: To make every program into a *straight sequence of actions*.

FACT: You cannot create a *loop* or a *branch* in BASIC without using *control* statements.

PROBLEM: How do you make BASIC *loops* and *branches* look like plain, simple action statements?

This problem actually has a simple solution. Our experience tells us that it is also easily taught to beginners in their first course in computing.

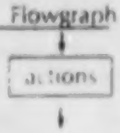
---

[1] *Computer Power* was also the subject of a 4-part series in TCT, Vol 9 #8 & 9 (April, May 1982) and Vol. 10 #1 & 2 (Sept., Oct. 1982).

What makes an action statement "simple"? It is the fact that the computer *always* performs the action and then *always* goes on to the next statement. A *sequence* of action statements, called an "action block," has this same property—the computer performs the *block* and then goes on. The action block can be represented like this:

ACTION BLOCK — Flowgraph

```
______ action statement
______ action statement
______ action statement
etc.
```

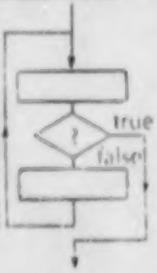


The action block is an example of a "one-in/one-out block". This phrase means that the only proper entry point into the block is the first statement ("in at the top"), and the only proper exit is the last statement of the block ("out at the bottom"). The flowgraph at the right below is a symbolic way of saying this.

That was easy and obvious. But what about loops? Can every BASIC loop be written as a one-in/one-out block? Indeed it can, and the general form of the loop block is shown below:

LOOP BLOCK — Flowgraph

```
______ REM—LOOP
______    do something
______
______
______ IF condition THEN
______    do something
______
______
______ GOTO
______ REM—END LOOP
```



The indented phrases labeled "do something" stand for the sequence of statements that are to be performed again and again during the loop. The word "condition" stands for an expression such as X > 10, or A$ = "QUIT." It tells when to stop the loop. The jump arrow after THEN means that the line number in the circle is the same as the line number of the REM—END LOOP statement. The jump arrow after GOTO has a similar meaning.

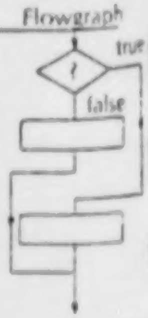
By following the above loop block outline (or its flowgraph symbol) you can see that it is a one-in/one-out block. The single entry point at the top is labelled REM—LOOP. The single exit point at the bottom is labelled REM—END LOOP. Notice also that each REM statement is the target of a jump arrow. The phrase after the REM explains the *reason* for the jump.

Notice that the GOTO and IF statements are necessary to make the loop block work. The GOTO causes the looping, and the IF causes the exit. Students taught this approach will learn about the GOTO and IF statements *not* as ends in themselves but only as *means* of building blocks such as loops and branches.

What about program branches? Can they also be written in the form of a one-in/one-out block? Yes, in every case. The branch outline looks like this:

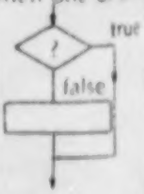
BRANCH BLOCK — Flowgraph

```
______ IF condition THEN
______    REM—FALSE
______       do something
______
______
______
______    GOTO
______    REM—TRUE
______       do something
______
______
______ REM—END IF
```



which may be abbreviated as follows when one of the two branches is missing:

```
______ IF condition THEN
______    REM—FALSE
______       do something
______
______
______ REM—END IF
```



The meanings of the phrases "do something" and "condition" are the same as in the loop block. If the "condition" in the two-way branch is true, the computer performs the TRUE "do something"; if false, the computer performs the FALSE "do something." Note also that a REM statement is the target of each jump and the remark explains the reason for the jump. Inspection of the outline or flowgraph shows that the branch block is indeed a one-in/one-out block. The entry point at the top is the IF statement. The exit point at the bottom is the REM—END IF statement.

Are More One-in/One-out Blocks Needed?

So far we have seen three kinds of one-in/one-out blocks: *actions, loops* and *branches*. Are there others that will be needed, or is there a limit to the number we and our students will need to know about?

The remarkable answer is that this set of three blocks is sufficient. In 1966, Boehm and Jacopini proved the following completeness theorem:

THEOREM: Any program logic, no matter how complex, can be resolved into actions, loops and branches.

The theorem has the following consequence:

COROLLARY: Every program can be written as a straight sequence of these blocks.

If this claim seems too good to be true, bear in mind that one block may be *nested* inside another. The "do something" part of a loop or branch may be another loop or branch as easily as an action block. For example, you can create a three-way branch by nesting one two-way branch inside another one. The main point, however, is that at any level of detail of a well structured program, the only thing one finds are actions, loops and branches.

That means that at the coarsest level, the program itself is nothing but a straight sequence of these blocks, as the corollary states. By using only these three types of one-in/one-out blocks, the problem posed earlier is solved. Instead of a straight sequence of statements, however, a well structured program is a straight sequence of action, loop and branch *blocks*.

Solving a Problem with One-in/One-out Blocks

Now let's see how to put into practice the power of the Boehm and Jacopini theorem. What better problem than the one that began this paper: Edsger's efforts to provide optional instructions at the beginning of a program.

Recall that the program began by (1) asking the user whether or not to print instructions. Then (2) it accepted input until the answer was "YES" or "NO," prompting in case anything else was entered. Finally (3), it printed either the instructions or the message, "OKAY. LET'S GET STARTED."

What kinds of structures correspond to these three steps of the program? Step 1 is the simple *action* of printing a question on the user's screen. Step 2 is a loop, since the input request may be made several times if the reply is not "YES" or "NO." Step 3 is an either/or situation—a *branch*. The following English language outline says what these parts of the program must do:

1. **ACTION:** Ask if instructions needed.
2. **LOOP:** Get input until the answer is "YES" or "NO."
3. **BRANCH:** If the answer is "YES," give instructions; otherwise say, "OKAY. LET'S GET STARTED."

Notice already how much clearer this analysis of the problem is than the spaghetti-code version that we began with. The process is divided into a *straight sequence* of three steps. The computer is to perform the first step and then go on to the second. Then it is to do the second step and go on to the third, etc.

The next phase in solving this problem is simply the translation of each step, one at a time, from English into the appropriate structures available in the programming language. In BASIC, the outlines shown earlier for actions, loops and branches are the ones to use.

Step 1 is a simple action and can be handled by a single PRINT statement:

```
10 PRINT "DO YOU WANT INSTRUCTIONS?"
```

That was easy. Step 2 is a loop, so we begin by copying down the general loop outline, filling in blanks with appropriate line numbers:

```
15 REM—LOOP
20      do something
25   IF condition THEN 40
30      do something
35   GOTO 15
40 REM—END LOOP
```

All that remains is to fill in the two "do somethings" and the "condition." The job of the loop is to get user input and, if necessary, to prompt for new input. The first "do something" must be an INPUT statement. The "condition" for exiting the loop must be that the user's reply is "YES" or "NO." Any other reply means that the second "do something" is performed. It must be a PRINT statement containing the prompt message. The finished block is this:

```
15 REM—LOOP
20      INPUT A$
25   IF A$ = "YES" OR A$ = "NO" THEN 40
30      PRINT "PLEASE TYPE YES OR NO"
35   GOTO 15
40 REM—END LOOP
```

Last comes the branch block for Step 3. Here is the general outline with lines numbers filled in:

```
50 IF condition THEN 70
55   REM—FALSE
60      do something
65      GOTO 80
70   REM—TRUE
75      do something
80 REM—END IF
```

When the computer reaches line 50, A$ is either "YES" or "NO." Therefore, the "condition" can be either A$ = "YES" or A$ = "NO"—it makes no difference which. Let's choose the latter. Then the first "do something" must print the instructions and the second one must say "OKAY. LET'S GET STARTED." Here is the complete branch:

```
50 IF A$ = "NO" THEN 70
55   REM—FALSE
60      GOSUB 1000: REM—INSTRUCTIONS
65      GOTO 80
70   REM—TRUE
75      PRINT "OKAY. LET'S GET STARTED."
80 REM—END IF
```

Notice above that the task of actually printing the instructions is defined elsewhere in a subroutine, even though it is presumably called only once, in line 60. This is done to make the branch block shorter and easier to read. The instructions will probably require many lines of PRINT statements. If they were inserted inside the false "do something," the true part would be pushed far down the page and away from the IF statement it goes with. The GOSUB with a trailing REM accomplishes the same purpose but also makes the logic of the branch easier to follow. (The use of subroutines to hide details brings up the topic of "top-down programming," which is also very high on our list of priorities for a first course in computing. A discussion of that topic needs an article of its own to do it justice.)

The whole program for these three steps now looks like this:

```
10 PRINT "DO YOU WANT INSTRUCTIONS?"
12
15 REM--LOOP
20     INPUT A$
25   IF A$ = "YES" OR A$ = "NO" THEN 40
30     PRINT "PLEASE TYPE YES OR NO"
35   GOTO 15
40 REM--END LOOP
45
50 IF A$ = "NO" THEN 70
55   REM--FALSE
60     GOSUB 1000: REM--INSTRUCTIONS
65     GOTO 80
70   REM--TRUE
75     PRINT "OKAY. LET'S GET STARTED."
80 REM--END IF
```

Blank lines separate one block from the text, and indentation shows blocks nested inside other blocks.

> ***"... the task of actually printing the instructions is defined elsewhere in a subroutine, even though it is presumably called only once ... This is done to make the branch block shorter and easier to read."***

Unfortunately, no micros allow blank lines and few allow indentation in their versions of BASIC, which is a major blunder on the manufacturer's part. Furthermore, a 32-character screen width can undo much of the clarity of indentation. Usually there is a way around the problem, such as substituting colons for spaces and cutting the identation widths in half. That is better than nothing but far from ideal. (Things will probably not get better on this front until schools insist on ANSI Standard BASIC before buying a computer.)

Conclusinns

It is too early to tell whether a structured approach to programming in BASIC really works—that is, whether teachers find it easy to teach and students learn it and use it. In the fall of 1981, about 600 students in 13 schools used the field-trial edition of our textbook. A team from Stanford University's School of Education conducted a formative evaluation.

It was a humbling experience to learn how much one doesn't know about teaching, even after doing it for decades. In the field-trial edition, some chapters were much too long; others were too short. Sometimes there was too much hand-holding, sometimes we lunged ahead too fast. To keep the book independent of any one computer, we put graphics off until late in the course; students said they wanted more excitement. Etcetera, etcetera.

As a result, Herb and I went back to the drawing board—in this case, the word processor—and ended up rewriting fully 90% of the textbook. We shortened and evened the length of chapters. We put in more independent projects. We moved graphics to the front of the book and wrote different versions of the book for each computer model. Etcetera, etcetera.

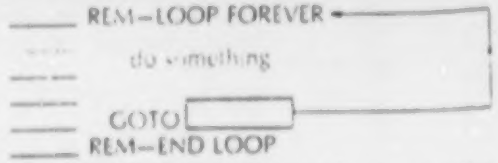
We like the result better, and we believe that it's working well in the three schools that are now using it. In one of the schools, the computer teacher is a librarian who had never taught computing before. He recently sent us listings of some of the work of his students. I have to confess that it brings tears to the eyes to see the lovely, readable, neatly indented, well-structured programs his seventh-graders are writing. Still, one swallow doth not a summer make.

Despite the statistically shaky ground I am on, I believe that some reliable conclusions can be drawn from our experience to date with teaching structured programming in BASIC. Here are a few that I feel most confident of:

1. **Start your students with action statements only and stick with them as long as you can.** GOTO, IF and even FOR/NEXT are very confusing. Beginners have much to master before they see jumps, loops and branches, so limit them to the PRINT, graphics and sound statements. Even with such limited tools, you will be surprised at what interesting projects your students can do.

2. **Keep variables a secret for at least a month.** Let students print string constants and plot points and lines with numeric constants for a while. After your class is confident about the way statements work with constants, introduce variables, LET and INPUT.

3. **After variables, introduce the GOTO statement for one purpose only—to make an infinite loop.** Students seem intrigued by a loop that goes on forever. They can make the computer count up to larger and larger numbers, explore arithmetic, and print strings down the screen. Show students this outline form for an infinite loop:



4. **Next introduce the IF statement for one purpose only: to exit the loop.** With this step, students are eased into the first of the two main control blocks.

5. **Teach FOR and NEXT as mere abbreviations for a special class of loops: namely, those that exit**

when a counter exceeds some value. This tactic makes it clear that the loop built out of REM, IF and GOTO statements is more general and can solve more looping problems than the FOR/NEXT loop.

6. **Next, show the outline form of the other main control block—the branch.** Make the point that all problems in program logic can be solved with actions, loops and branches.
7. **Last, show how to nest one block inside another.** This is the final lesson to be learned about using block structures.

This sequence of topics needs to be carried forward slowly and deliberately, with plenty of opportunity for students to practice and review what they have learned previously. The biggest mistake a computer teacher can make, in my opinion, is to rush through the grammar rules for all the common BASIC statements in the first three or four weeks of a course. This tactic leads to misconceptions, lack of confidence, and ultimately the inability to handle complex problems.

We often make the mistake of thinking that our course is the last computer course our students will ever take. That is extremely unlikely. It is far better to launch a student securely in the right direction with dependable tools than it is to try to cover every last little nook and cranny of whatever dialect of BASIC is on the computers at hand.

[Ed. note: The textbook Dr. Luehrmann refers to in this article is Computer Literacy: A Hands-On Approach*, 450 pages, 8" x 11". Price is $17.97 to schools. The teacher's resource guide is $14.01 (free with adoption). The Apple version is published and the TRS-80 version should be out by September 1983. Contact Marie Terry, 800/223-4180, McGraw-Hill, 1221 Avenue of The Americas, New York, NY 10020.]* END■

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ANNEXE IX

Documentation pour Computer
Using Educators (CUE)
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The California Challenge

A summer institute at Stanford helps prepare teachers for California's computer giveaway.

Linda V. Williams

Summer used to be the time kids went swimming and teachers worked on their tans. These days parents pack the kids off to computer camp, and school districts hustle the teachers off to summer computer institutes.

This summer at Stanford University 200 teachers gave up their chance to bask in the sun and spent a summer month peering at the luminous green glow of the computer screen—in many cases the screen of an IBM PC. For most of the teachers, especially those from California, the institute had a special importance and urgency.

> National attention is focused on California's computer giveaway.

In California, 1983-84 will provide the test of whether schools can effectively integrate computers into their programs. Changes in that state's tax laws are encouraging corporations to donate computer equipment to the schools, and educators and lawmakers across the country will be watching the results of this experiment. The teachers at the Institute on Microcomputers in Education were anxious to learn how to make the best use of the new equipment.

The institute was sponsored jointly by the Stanford University School of Education and Interactive Sciences, Inc. (ISI), a nonprofit organization devoted to the study of the role of computers in education. The sponsors had originally planned to give the program an international focus, but events in California last fall convinced the organizers to shift their attention closer to home.

A Computer in Every School

In September 1982 the California State Legislature passed Assembly Bill 3194, which offered corporations a tax break for donating hardware and software to schools. With this incentive many corporations began making plans to provide schools with some of the hardware that educators have long proclaimed that they needed but could not afford.

Yet the donated equipment is a mixed blessing for teachers. Now that they have the computers, the pressure is on to demonstrate that the schools can make effective use of them.

National attention is focused on California's computer giveaway. Success or failure will influence policy makers in other states and at the national level. At a time when school budgets are threadbare and resources are overextended, do the schools have the human resources to match the mechanical ones?

People to Match the Computers

The ISI staff and the Stanford faculty decided to use this summer's institute to prepare teachers to meet the challenge of the new equipment. They recognized that in schools where teachers had little or no experience with computers, the new equipment would end up in the custodian's closet or be "captured" by a single aggressive teacher.

One way to prevent that unfortunate situation was to make sure that as many districts as possible had teachers capable of integrating computers into the total school program. The institute's sponsors made special efforts to attract California teachers to the international program in July, and a second month-long institute aimed specifically at California educators was planned for August. Knowing that many of the districts that needed help the most lacked the funds to send teachers to the institute, ISI President Joan Targ and Vice-president Jeff Levinsky coaxed California foundations into granting scholarship money.

time he was waiting for a machine like the PC to come along.

Rowe told the teachers that in the middle of the 1960s IBM produced a unique educational computer-assisted instruction (CAI) hardware system, the IBM 1500. The company made only 25 of these systems, and they were used for research in CAI.

That research convinced IBM that CAI was not yet practical. The hardware was too expensive, and software was considerably more complex to produce than researchers had expected. According to IBM's estimates, it required from 100 to 1000 hours of work to produce one hour of course material.

With the introduction of the personal computer 15 years later, affordable hardware was finally available, and IBM was ready to tackle the task of providing educational software for the PC. Rowe explained that the company is not relying solely on its own resources to achieve that objective.

"The quantity of what's required in the marketplace is staggering," he explained. Even IBM doesn't have the resources to produce materials in all areas. However, the company is developing and marketing some materials itself. Rowe gave his audience a preview of one such program, Writing to Read, developed by Dr. John Henry Martin. That program is in its second year of nationwide evaluation by the Educational Testing Service and IBM. It uses a voice synthesizer and the graphics capabilities of the PC to teach young children reading and writing.

In addition, the company encourages individuals both inside and outside IBM to develop and submit software to run on the PC. The software is tested and evaluated, and if accepted is marketed by IBM.

A third major source of software is the individuals and publishers who develop or adapt materials to run on the PC. "A lot of what's available today was developed because people decided they wanted their programs to run on the IBM PC," Rowe asserted. He cited Houghton-Mifflin's reading and language arts programs for grades three through eight. Those programs consist of 240 disks.

Rowe reminded teachers that despite the rapid progress being made in the educational uses of computers, the field is still at a very early point in what will be at least a 5- to 10-year learning curve. Most of the materials available are drill and practice exercises because they are the easiest to produce.

Tutorials that teach new material and simulations that help students integrate information and develop problem-solving skills will come more slowly because they are more difficult to produce.

For a field in its early phases educational software is growing amazingly fast. And although many of today's products may seem crude in 5 years, at the moment they demonstrate impressive gains for the industry. For teachers at the institute, IBM's progress in the field was good news indeed.

Participants ventured into the wilds of Silicon Valley to visit the Xerox PARC Research Laboratory, Hewlett-Packard, and the Computer Tutor Camp. Dr. John Chowning, director of Stanford's Center for Computer Studies in Music, took them behind the scenes just prior to a concert for a computer music demonstration.

In addition to high school tutors and superstar speakers, participants found another invaluable resource at the institute—each other. During the intensive month of study, they found time to share ideas, experiences, and problems.

The relationships developed at the institute laid the foundations for a network of professionals who will assume leadership roles when they return to their communities. That network will be another important factor in strengthening the impact of institute participants on the educational system. Horace King of Riverside, California, summed up this perspective: "It's not just working with computers, but working with people."

Time Will Tell

The summer institute will almost certainly have a major impact on what the 200 participants do in their classrooms next year, but will it affect the larger educational community? Will the teachers become the seeds California and other states so desperately need to move their educational systems into the computer age? Time will tell.

There is, however, good reason for optimism. Last spring ISI conducted a poll of the participants at its 1982

(OVER)

COMPUTER TUTOR PROGRAM

To: Staff
Parents

From: Joan Targ
Renate Brewster
Mike Leonard

For the last several years Jordan Middle School has participated in a project called Computer Tutors. Jordan supports the program through SIP and GATE funds. This is in addition to the advanced elective and the computer center assistant classes offered through the regular school program. Additional funding for extensions of the program comes through the Luke B. Hancock Foundation, the Walter Johnson Foundation and IBM.

Our purpose is to enable all interested students to learn to use the computer in a variety of ways including programming (BASIC), word processing (WordStar), and spreadsheet analysis (Multiplan). A second and important purpose is to encourage the involvement of girls in programming and computer based projects through counseling and peer role modeling so as to widen their perception of career options in mathematics and science related fields.

To accomplish this we run numerous small individualized programming classes taught by experienced "tutors" drawn from our own student body. These classes meet once a week, generally, for a total of ten to twelve sessions and are scheduled throughout the school day. Students attend on a contract basis during released time from a regular class. They must have both teacher and parent permission and are responsible for any work, tests, etc., given during the class time missed. If problems arise because of class absences, the teacher may terminate the contract at any time. When a student successfully completes the computer lessons he or she becomes a tutor in turn. This may require a new contract if it is for a different time.

Staff, students and parents have been very supportive of the program. Last year over 700 youngsters participated in this manner. Staff and parents are also encouraged as learners. Opportunities to learn BASIC and word processing may be arranged. We hope that many of you will take the opportunity to acquaint yourselves with this interesting and valuable tool. Parents help extend the use of the computer center for our students by volunteering during the week or on the weekends. If you would like information about possible volunteer and/or learning opportunities, please fill out the slip below.

In addition to the programming classes, students are eligible to join in other activities which may involve word processing, help with teaching techniques, advanced programming, and possibly other languages and applications such as LOGO and data base management. Often these activities can be related to regular classroom work, ie. simulations for social studies or science classes, designing spelling or grammar games for English and problem solving in mathematics. We need to have your ideas about the kinds of projects you would like to see students undertake.

The computer center is located in Rooms L-6 and L-7. Several open house sessions will be scheduled. In the meanwhile, if you have any questions or just want to know what's going on, please come in or call us at 855-8259.

Please check and return to Joan Targ, Mike Leonard, or Renate Brewster:

I am interested in learning more about the Computer Tutor program: ☐

I would like to know about volunteering in the Computer Center: ☐

I am also interested in learning to use the computer:
BASIC ☐
Word Processing ☐
Other ______

Name ______________________________

Home phone ______________ Work phone ______________

(9-83)

AVAILABLE FOR HANDS-ON USE BY EDUCATORS

Our MICROCOMPUTER CENTER is equipped with the following microcomputers, each with dual disk drive, modem, and printer:

- Apple II Plus, IIe
- Atari 800
- Commodore PET 4016 and 8032
- Commodore 64
- Radio Shack Model III

Hardware equipment also includes other peripherals, such as the following:

- Whitney Computer Asssited Television Authoring System (CATI)
- MUPET disk sharing system for the Commodore PET

FOR YOUR CONVENIENCE

Blank DISKETTES are available for professional use for $3 each (Tax incl.). P.O.s are accepted, made out to: Educational Media Center, Mail Code 231, 100 Skyport Drive, San Jose, CA 95115.

SOFTSWAP program disks for the APPLE and ATARI are also available in the Educational Media Center for $3 each (see above). Or arrangements to copy SOFTSWAP programs onto your own blank disks may be made by calling the Microcomputer Center (Bonnie: 947-6528).

RESOURCES AVAILABLE TO EDUCATORS

Over 200 publishers of educational software have provided our Center with a variety of programs which is kept in our Microcomputer Center. Visitors are welcome to preview and use these programs, but they are copyrighted and may not be copied. Contributors include publishers such as SRA, Milliken, Borg-Warner, Random House, and others. Ordering information and prices are available, but no commercial software is sold through the Center.

Minnesota Educational Computing Consortium (MECC) programs are available for preview only on Apple and Atari.

A collection of administrative software has also been established as well as an assortment of career guidance software.

"SOFTSWAP" is a collection of educational software which is PUBLIC DOMAIN and is available for copying. Programs for Apple, Atari, TRS80 and PET are included in this donated material.

In addition, software directories, catalogs, and program reviews are available for your inforamtion. The Center also receives several fine computer education journals including Electronic Learning, Classroom Computer News, Educational Technology, Creative Computing, The Computing Teacher, BYTE, Nibble and Softalk.

WE CAN SERVE YOU AS ....

AN INFORMATION CENTER

where books, journals, curriculum guides, software catalogs, and reference materials related to the use of computers in instruction are readily available.

A DEMONSTRATION CENTER

where educators can have hands-on experience with several microcomputers and determine which one may be best suited to their needs.

AN EVALUATION CENTER

where instructional software may be previewed for field-testing and evaluation before purchase.

A SOFTWARE EXCHANGE

where public domain microcomputer programs written by other educators are shared and may be copied for classroom use.

A WORKSHOP CENTER

where educators can meet to share their experiences and where new products and programs can be presented.

CALIFORNIA SOFTWARE CLEARINGHOUSE

The Teacher Education and Computer (TEC) Center program divides California into 15 regions, each with a TEC Center responsible for providing inservice to teachers in the fields of science, mathematics, computer literacy, and other subject areas. The Microcomputer Center in the San Mateo County Office of Education has been designated the statewide Software Library and Clearinghouse for the TEC Centers.

The Clearinghouse has four major responsibilities:

1) to develop a cadre of software evaluation specialists who will train teachers in their regions as software evaluators,

2) to construct a subject area/grade level Preview Guide of highly recommended software,

3) to provide rotating collections of software for preview and evaluation at each TEC Center, and

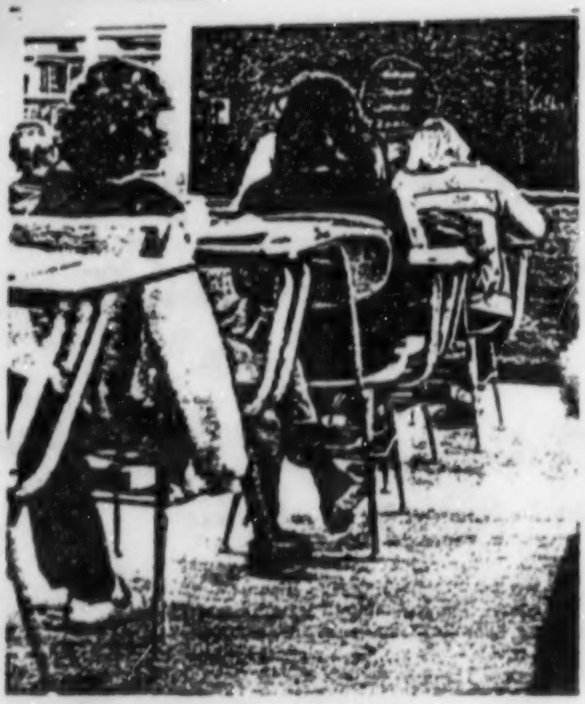
4) to collect and disseminate critical evaluations of instructional software.

Successful completion of these four responsibilities will expand the base of trained evaluators throughout California, help them to identify the best currently available software, and also provide new software for preview.

A Software Evaluation Forum was held in San Mateo County in January, 1983 for the purpose of developing the cadre of software evaluation specialists and establishing the Preview Guide of highly recommended software. Two representatives from each TEC Center Region and representatives from successful software evaluation projects at state and regional levels throughout the United States were invited to participate. Educators helped to establish the Preview Guide and also provided an added dimension to the work with the software specialists from the TEC Centers.

Other activities of the Clearinghouse include the publication and dissemination of software reviews received from the 15 TEC Centers, supporting the work of the California Library Media Consortium for Classroom Evaluation of Microcomputer Courseware, coordination of the development and distribution of SOFTSWAP public domain programs, contacts with software publishers, and investigation of the possible electronic dissemination of software evaluations and related information. Individuals who desire information on computers, computer training, and software reviews or demonstrations should contact their regional California TEC Center.

in The Budget



EDUCATION

By MICHAEL FALLON

Of all the elements to emerge from the 1983 budget fight, none may prove more important over the years than public school reform. Like Siamese twins, school reform and the budget were inseparable this year, tied together by politics and economics.

Convinced finally that something must be done to improve student achievement, particularly in math and science, and to discipline lax or incompetent teachers, lawmakers were ready early this year with a host of school improvement bills. However, the politically powerful teacher unions stood ready to block such legislation, or most of it, unless they were assured of getting the wherewithal for a substantial teacher pay hike; that is, a substantial increase in state aid to schools.

But such an increase (initial talk was in the $1.2 billion range) meant either higher taxes, which the governor opposed, or radical cuts in other state spending, which Democrats disliked. The result was a compromise that provides an additional $800 million for schools this fiscal year and inaugurates a sweeping package of reforms.

"Sweeping" is a journalistic term, but the California bill clearly sweeps — as well as mops, dusts and skirts — around issues as diverse as tougher student standards and easier teacher layoffs, merit pay and student discipline, year-round schools, bus purchases and bilingual education.

Among 80 changes broadly described as reforms, the bill reimposes statewide high school graduation requirements and proposes a longer school day and year. It establishes a "mentor" teacher program, a modified form of merit pay. It allows school districts to use local standards to dismiss probationary teachers during their first two years of employment, makes inroads into teacher seniority protection and requires that new teachers take 150 hours of continuing education every five years to maintain their credential.

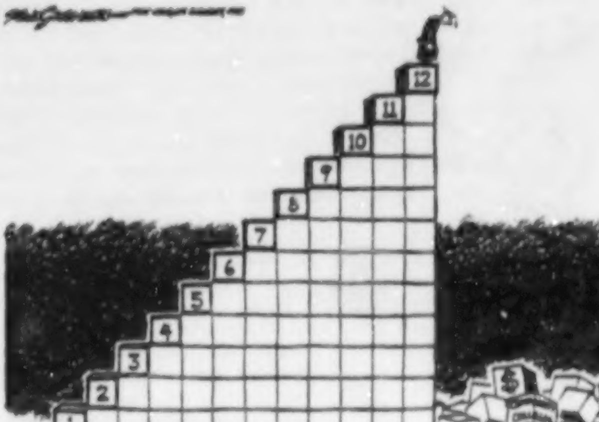
Michael Kirst, a Stanford University education professor and former president of the state Board of Education, finds "a whole new agenda" in the California reform legislation, but he cautions that the large number of reforms does not represent a careful sifting of priorities nor an analysis of what could be implemented. "Almost any ides that had merit was included in the bill," he says. "I'm worried about overwhelming schools with too many reforms they can't handle."

After the 490-page, two-volume bill emerged from a six-month cobweb of negotiations, Capitol observers gave special credit for keeping the fragile talks alive to two state senators — Republican John Seymour of Anaheim, a newcomer to education, and Democrat Gary Hart of Santa Barbara, the bill's chief author who kept lines open both to Republicans and to his own party's freer-spending legislators and their teachers' union allies.

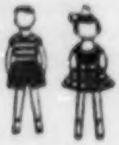
Deukmejian, given his no-tax-increase stance, made a substantial concession in boosting an original offer of $350 million in additional state school aid to $800 million. That represents an eight percent increase for schools above the $10 billion they received in 1982-1983 and a marked departure from the low priority assigned to school funding in recent years. In return, Deukmejian obtained changes in the bill to require continuing education for all new teachers as a condition for keeping their license, to allow teachers to be laid off as late as August 15th under certain circumstances, and to reduce the pay given laid-off teachers working as substitutes.

The governor vetoed from the bill the entire $1.9 billion that had been proposed for 1984-1985 which included allocation of the $800 million from 1983-1984, $500 million to implement such reforms as the longer school year and $600 million for a cost-of-living increase. While committed to providing at least an additional $800 million, he said, "Prudent management requires that we make decisions on augmentations to this funding for 1984-1985 during next year's budget deliberations."

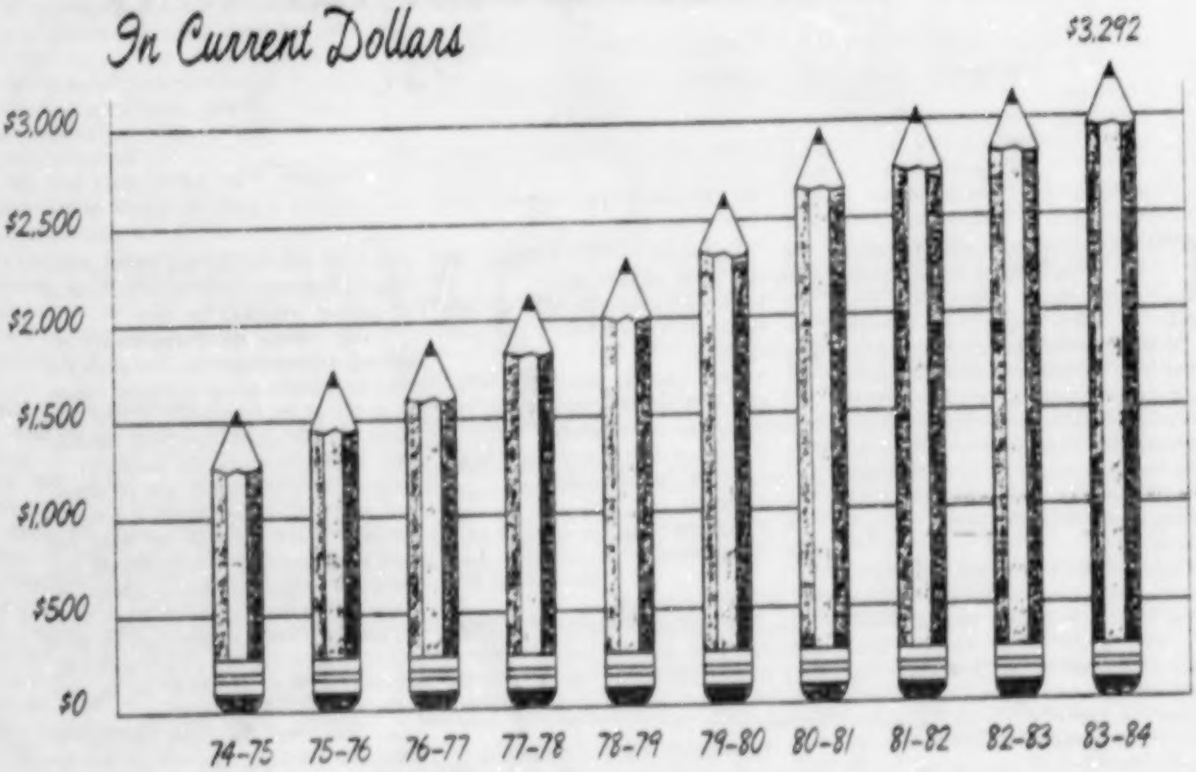
Deukmejian's action raises doubts that school districts will be able to meet an important provision of the bill and offer summer classes next year in math, science and "other critical academic areas." If history repeats itself, summer sessions will



Michael Fallon, an education reporter for the Sacramento Union, wrote "Challenge for the community colleges" for the March 1983 issue of California Journal.



K-12 Education Funding Per Pupil In Current Dollars



be well under way before the Legislature adopts a 1984-1985 state budget.

Hart, a former high school teacher, realistically accepts the fact that even a landmark education bill will not transform schools overnight. "We're making an effort to strengthen academic standards. That's sometimes difficult to do in a state law," he said. Even with "long overdue" provisions — like the one that would make it easier to dismiss incompetent teachers — Hart believes that "you won't see changes until you get better administrators and train them to evaluate." Under his bill, this training would begin with a $500,000 appropriation in 1984-85.

For Hart, a promising feature of the bill is the establishment of a "mentor" teacher program. At his urging, teachers will have the decisive vote in selecting colleagues they consider outstanding to work as mentors with beginning instructors and for curriculum development. Mentors will receive a stipend of up to $4,000 annually for the additional duties. "California is the first state that's really trying some version of merit pay," Hart said. "In a sense, it's an exciting experiment. I don't know if it's going to work, but it deserves a chance."

Hart is also enthusiastic about a proposal introduced by his principal co-author, Democratic Assemblywoman Terese Hughes of Los Angeles. It institutes challenging "Golden State" achievement tests available on a voluntary basis to high school seniors who seek honors at graduation. "It's an incentive to the academically able," Hart said.

A prominent figure in the Hughes-Hart Educational Reform Act of 1983, state Superintendent of Public Instruction Bill Honig earned high marks for his tireless campaign to enlist support for the finance-reform package, particularly in the business community. However, Honig suffered wounds which may reopen in the Democrat-dominated Legislature because he suddenly shifted from attacking the Republican governor to privately negotiating with him. "You pay a price to maintain your independence," Honig says. "Right from the start, we tried to make it bipartisan."

As Honig assesses the bill: "It sets the stage for takeoff in public schools. It gives the resources necessary so that the momentum at the local level can continue."

Writing a formal proposal to obtain microcomputer funding

A good proposal presents a convincing case for making microcomputers a fixture in the business ed department

by Adaline Jones Eastman

Computer literacy and keyboarding skills have taken their place next to readin', writin', and 'rithmetic as basic skills for survival in the business world. Computers in the classroom provide business education students with marketable skills in data processing, word processing, and accounting, and students in all disciplines must know keyboarding to tap into the tremendous information and communications networks proliferating in today's offices.

The challenge now facing many business educators is to convince school decision makers or outside funding agencies that business ed classes need microcomputers and that funding to buy computer hardware and software for the business ed department is a top priority. A formal proposal is the most effective way to communicate these needs.

What's in a proposal?

The purpose of a formal proposal is to convince administrators or a funding agency to take positive action in implementing the request contained in the proposal. While outside funding agencies often have special requirements for writing proposals, a funding proposal generally contains the following:

1. A title page

2. A proposal abstract (a summary of the main ideas in the proposal not to exceed 250 words).

3. The body of the proposal:

a. A statement of the purpose of the project.

b. Objectives for the proposed project.

c. Procedures to be followed in achieving these objectives.

d. The target population to be served.

e. Personnel to be involved and their qualifications.

f. A time schedule identifying when each step will be implemented and the anticipated date of completion.

g. A discussion of how the results of the project will be evaluated.

4. A budget

5. A bibliography

6. Appendices

Preliminary research

Because a proposal can make or break a project, your proposal should be carefully thought out before you begin writing. Preliminary research should be done as follows:

1. Investigate sources of funding—both from your school and from outside funding agencies—and the requirements for writing proposals for each.

2. Determine the purposes for acquiring microcomputers. The goals you wish to achieve using computer equipment will be the foundation of your proposal. At this stage, you must consider why microcomputers are necessary to achieve these goals and, just as important, why existing equipment in your department is not adequate for what you wish to accomplish. The objectives you formulate might address computer literacy, hands-on vocational training in accounting, word processing, or data processing, or any other training in your department that can best be accomplished using microcomputers.

3. Document the need for microcomputer training. Add support to your objectives by finding evidence that microcomputer training in the business ed department will be satisfying the needs of the school, students, and the community. Conduct a review of literature describing personal and vocational microcomputer applications, and survey local businesses regarding how microcomputers are being used in the office. Also, ask about projected applications for the next five years or more.

4. Develop course outlines for each course or unit in which microcomputer instruction is planned and determine objectives for each course.

5. Gather information on software that is related to the proposed course content. Develop a bibliography of software, correlated texts, and their costs. Investigate the microcomputer systems

***Adaline Jones Eastman** is acting associate dean of Ball State University's College of Business in Muncie, IN.*

that are compatible with the software, including capital and maintenance costs.

6. Estimate the number of students that will be enrolled in each proposed course.

7. Determine the available lab/classroom space in your school.

8. Determine the number of microcomputers and supporting equipment needed to accomplish your objectives.

9. Determine the three microcomputer systems that are most feasible for the courses you have developed. Availability of appropriate software and instructional materials, as well as capital and maintenance costs, are major factors to be considered.

10. For each of the three systems identified in Step 9, develop a budget and determine the total cost for installing the systems. Consider alternate plans for phasing in the installation—i.e., a one-year, a two-year, and a three-year plan—and develop a time schedule for phasing in each plan.

Writing the proposal

After the preliminary research has been done, the formal proposal can be written. Remember: A formal proposal is *always* written in the third person.

Here are some guidelines to follow when writing your proposal.

Statement of the purpose of the project. Your goal here is to convince the funding agency that microcomputers are a necessity in the business ed curriculum and that funding will benefit the school, students, and the community. A clear and practical statement of purpose is needed. For example:

> The purpose of this project is to acquire microcomputers for general business and accounting classes so that students may develop computer literacy and receive practical training using computerized accounting systems.

The statement of purpose should also identify the goals for microcomputer instruction in each course you have outlined. (The actual outlines of the courses will appear in an appendix, but when specific courses are mentioned in the text there should be a reference to the appendix where the outline appears.)

Documentation of the need for microcomputer training should follow. This presentation should begin with a brief description of the business education program in the school, including enrollment figures and information about microcomputers already in use in the program and how they are being used. If applying to an outside agency, this section should also include a mention of demographic and economic data for the school community and a description of your school.

Next, present the results of your survey of local businesses, explaining how they reflect the need for microcomputers, and discuss relevant findings from your review of literature.

Objectives for the proposed project. State the goals that will be accomplished by providing microcomputer training in the business education department. Specific objective statements should mention: (1) the objectives for each course you have outlined, (2) the number of students to be served by each course and the goals to be accomplished, (3) the number of microcomputers and supporting equipment required, (4) the software and instructional materials to be purchased, and (5) a brief description of the course content.

The following is an example of an objective statement:

> After one semester of training, students in the computer literacy course will have developed the competencies identified in the computer literacy course outline appearing in Appendix A on pages 36 and 37 of this proposal.

Procedures to be followed in achieving the objectives. Provide a step-by-step description of how microcomputer training will be implemented if funding is provided. You should include details on some of the preliminary steps—developing course outlines, gathering information on software and instructional materials, and estimating enrollments—plus the following:

1. Develop a time schedule for the computer installation, and set a date on which instruction should begin.
2. Develop a plan to evaluate the courses with microcomputer instruction.
3. Purchase microcomputers and supporting equipment.
4. Purchase software and instructional materials.
5. Schedule the installation of the equipment.
6. Begin instruction.

Target populations to be served. Identify which students will receive microcomputer instruction and how they will benefit.

Personnel. List the teachers for the proposed courses and any special qualifications they have for teaching these courses. A personal data sheet for each teacher should appear in an appendix.

Time schedule. A time schedule is a display of the starting and completion times for each step in the procedures you have outlined, arranged chronologically according to starting time. The display may be a graph or columnar listing with the headings *Procedure, Starting time, Completion time.*

Project evaluation. Discuss how the course and the effectiveness of the microcomputer training will be assessed. Consider measures such as a pretest and a posttest, or plan a follow-up on graduates of the proposed courses to determine if microcomputer training proved significant in job placement, if graduates use microcomputers on the job, and if the instruction they received was relevant to their job duties.

Budget. The budget included here should be the one for the total cost of installing the microcomputer systems for which funding is being sought. Alternate plans for phasing in the microcomputer systems and budgets for these plans should be included in an appendix.

Bibliography. The bibliography for a proposal follows the same requirements as a bibliography included in a formal report, with each footnote covered by a bibliographical citation.

Appendices. This section is used to display information supporting discussion in the body of the proposal. A separate appendix, with a title page, should be used for each different kind of support. For the proposal described here, Appendix A would contain course outlines, Appendix B would include personal data sheets for the teachers who will be teaching the courses; and Appendix C would contain alternate plans for phasing in the instruction and accompanying budgets. In addition, if there are any terms in the proposal that may not be understood by the reader, a glossary of terms should appear in a separate appendix.

Typing the proposal

A proposal is typed in formal report form. Any one of the widely used style manuals may serve as a guide. However, if the funding agency to which the proposal is being submitted has specific requirements for typewritten proposals, care must be taken that these requirements are met.

ANNEXE X

Documentation sur Learning Company

THE LEARNING COMPANY
BACKGROUNDER

THE LEARNING COMPANY
BACKGROUNDER

Chris Mullins
The Learning Company
(415) 328-5410

Jeri Eaton Flinn
Burson-Marsteller
(408) 980-9250

INTRODUCTION

Future Computing, a Texas-based research firm, projects that the educational software market will grow from $70 million in 1982 to almost $1 billion by 1987.

Computers have been used in education since the early 1950s, but the majority of programs imitated traditional classroom instruction -- merely a computerized version of familiar math drills, flash-cards and multiple-choice quizzes.

Not until The Learning Company was founded in 1979 by Dr. Ann Piestrup, an educational psychologist, was the full potential of the computer as a learning tool tapped. Under her direction, The Learning Company (TLC) became the first company to use the power of the personal computer as a playful, interactive learning tool.

The Learning Company continues to design, develop and market educational microcomputer software for children aged 3 to 18.

HISTORY

As an educational psychologist, Dr. Piestrup spent more than 10 years travelling around the nation researching and evaluating existing educational tools.

With the emergence of microcomputers, it was a logical extension of her work to investigate this new medium. In the late 1970s, she found that the educational software being developed by professional programmers was not educationally sound and programs developed by educators failed to take full advantage of computers.

She believed the computer could become a powerful learning tool, and decided to pursue the development of software herself.

In 1979, aided by a grant from the Apple Education Foundation and, in subsequent years, by grants from the National Science Foundation/the National Institute of Education, Piestrup founded The Learning Company. She worked closely with programmers to develop playful, interactive learning software, capitalizing on the color, graphics and sound capabilities of microcomputers.

The acceptance of these programs by children, parents and educators led to the decision to begin marketing these products commercially. In 1982, The Learning Company raised its first round of venture capital to begin this effort.

In fiscal 1982-1983, TLC earned revenues in excess of $1 million.

TLC MARKETS

The Learning Company is aggressively marketing educational software in both the consumer and educational arenas. TLC is already established in both of these booming markets and is well situated to meet the growing demands.

To reach its markets, TLC uses numerous outlets for the distribution of its products.

On the consumer side, there has been a rapid diversification of distribution channels. Now in addition to computer stores, TLC's products are offered through a wide variety of outlets, including software stores, book stores, department stores, mass merchandisers, toy stores and direct mail.

In addition to working with several large distributors, such as Softsel and Micro D, TLC has signed contracts with IBM, major book publisher Simon & Schuster and American Express.

When IBM announced the IBM PCjr in November 1983, the giant computer company also announced that it would offer three TLC software programs for the PCjr through its product centers. Of the 24 software programs Big Blue announced for its new home computer, TLC products were the only line of software.

Through Simon & Schuster, TLC software is distributed to major book outlets, such as B. Dalton, Walden and Crown Books. American Express, the premier direct mail firm, is featuring TLC programs in its first software catalog, "The Best of the Best."

For the schools, TLC has developed special classroom packages that include back-up disks, teacher's guides and workbooks. In an agreement with Addison-Wesley, this major textbook publisher will distribute these classroom versions to the schools.

PRODUCT DEVELOPMENT

The Learning Company's products range from introducing 3-year-olds to the basic concepts of right and left to challenging 18-year-olds about computer circuitry.

All programs emphasize skills often overlooked in traditional curriculum -- logical thinking, problem-solving, conceptual learning and creativity.

Unlike video games which are created to be hit titles with short lifespans, TLC programs are created based on fundamental concepts of learning to ensure enduring quality. A set of guidelines is followed in all of TLC's development efforts based on Swiss psychgologist Jean Piaget's theories.

The software creates a world where failure is impossible and success is rewarded with the opportunity to discover new arenas.

Mastery leads to even greater challenges. The child, not the computer, is in control.

The entertainment in TLC software is also integral. TLC's experts believe an engaged child learns best and that playful learning can be exploratory.

Before coming to market, all TLC products are extensively field tested with hundreds of children in homes and schools to ensure they are geared for the appropriate age level and meet TLC's standards of educational value and playful format. Once in the marketplace, field testing begins again to ensure that learning continues over time and that the programs capture and hold children's attention.

This care given to the development of TLC's product line has led to numerous awards from several sources, including Learning Magazine, InfoWorld, Parent's Choice and the Apple Education Foundation. TLC's products have also received the coveted approval of the National Education Association.

TLC PROGRAMS

The Learning Company has 14 products in four learning areas: logic and problem solving, reading, math and art. All 14 products marketed by TLC were developed on the Apple II, but many are now also available on the IBM, Atari and Commodore 64 microcomputers.

TLC software programs are priced between $29.95 and $49.95.

LOGIC AND PROBLEM SOLVING

TLC's logic and problem-solving programs, GERTRUDE'S SECRETS, GERTRUDE'S PUZZLES, MOPTOWN PARADE, MOPTOWN HOTEL and ROCKY'S BOOTS, are for children aged 4 and up. Each program encourages different aspects of logical thinking.

GERTRUDE'S SECRETS -- Helps children develop logical thinking skills. Children learn to categorize and recognize patterns while solving playful puzzles and can even create their own puzzle pieces. Seven games for ages 4-10. Award: _Learning Magazine's_ Best Microcomputer Software of the Year

GERTRUDE'S PUZZLES -- Children develop abstract thinking skills in the animated world of Gertrude the goose. They can solve complex logic puzzles and even design their own playing pieces. Six games for ages 8-13. Award: _Learning Magazine's_ Best Microcomputer Software of the Year

MOPTOWN PARADE -- Helps children develop thinking skills and learn problem-solving skills as they strategically arrange the Moppet characters. Seven games for ages 6-10.

MOPTOWN HOTEL -- Children learn to hypothesize and develop strategic thinking skills as well as complex problem-solving skills while arranging Moppets in Moptown's fantasy world. Seven games for ages 9 and up. Award: _Learning Magazine's_ Best Microcomputer Software of the Year

ROCKY'S BOOTS -- Children learn the basics of logic and circuitry while designing logic machines using simulated computer circuits. Features 39 games plus the ability to design your own games. Ages 9 and up. Award: _InfoWorld's_ runner-up Software of the Year, _Learning Magazine's_ Best Microcomputer Software of the Year

READING PROGRAMS

TLC has pre-reading and reading programs for children aged 3 to 10. The programs, JUGGLES' RAINBOW, READER RABBIT and THE FABULOUS WORD FACTORY, WORD SPINNER and MAGIC SPELLS, all teach essential, yet different, reading skills.

JUGGLES' RAINBOW -- Children play with dancing rainbows, butterflies and windmills, while developing important reading and math readiness skills. Concepts like above and below and right and left are mastered by even very young children. Ages 3-6. Awards: Learning Magazine's Best Microcomputer Software of the Year, Parent's Choice Best Microcomputer Software of the Year

READER RABBIT AND THE FABULOUS WORD FACTORY -- By helping Reader Rabbit match pictures and words, label boxes and load words into a word train, children learn essential pre-reading and early reading skills. They also learn to recognize and spell more than 200 three-letter words. Ages 5-7.

WORD SPINNER -- By taking young readers on a whirl through the alphabet this program teaches the building blocks of reading. In building more than 500 three-letter words and 1,000 four-letter words, children learn to recognize word patterns and develop critical vocabulary and spelling skills. Ages 6-10.

MAGIC SPELLS -- Children learn to spell in an adventure world of castles, demons and wizards. They spell and unscramble words using the program's 14 word lists or by creating their own lists. Ages 6-10. Award: Learning Magazine's Best Microcomputer Software of the Year

MATH PROGRAMS

TLC has number programs for children aged 4-13. Each program, BUMBLE GAMES, BUMBLE PLOT, ADDITION MAGICIAN and NUMBER STUMPER, teaches different mathematical skills and encourages flexible thinking about numbers.

BUMBLE GAMES -- Helps children develop fundamental math skills by playing with Bumble, a friendly creature from the planet Furrin. Children learn to plot numbers and even create their own graphics. Six games for ages 4-10. Awards: Learning Magazine's Best Microcomputer Software of the Year, Parent's Choice Best Microcomputer Software of the Year

BUMBLE PLOT -- Children learn advanced math skills while trapping robbers and discovering underwater treasure. They create original computer graphics by plotting numbers on increasingly complex grids. Five games for ages 8-13. Awards: Parent's Choice Best Microcomputer Software of the Year, Learning Magazine's Best Microcomputer Software of the Year

ADDITION MAGICIAN -- This fast-paced, race-against-the-clock number strategy game teaches children basic concepts of addition and flexible thinking about numbers. Children build magic walls around groups of numbers that add up to target sums. Ages 6-10.

NUMBER STUMPER -- This computer-age version of a classic 14th century game of chance teaches basic addition and subtraction. Children create and solve mathematical equations from animated dice and develop abstract reasoning and strategic thinking skills. Ages 6-10.

ART PROGRAM

TLC's first art program, COLORASAURUS, teaches the world of colors to children aged 3-6.

COLORASAURUS -- A new type of coloring book, this program uses colorful dancing dinosaurs and an outrageous volcanic world to help teach children color discrimination, matching and memory skills. Ages 3-6.

MANAGEMENT

FOUNDER AND CHAIRMAN OF THE BOARD — DR. ANN PIESTRUP -- Dr. Piestrup is an internationally recognized authority on the application of microcomputers to children's learning. She has designed prize-winning software for children, has published many technical articles and books, and is a frequent speaker at technology and education conferences.

Dr. Piestrup has 10 years of experience as an educational researcher at RMC Research Corporation and the American Institutes for Research and has consulted on projects with school districts nationwide, universities and research companies.

She earned doctoral and master's degrees in educational psychology at the University of California at Berkeley and her undergraduate degree at Seattle University.

PRESIDENT — MARCIA KLEIN -- Ms. Klein brings a combination of marketing, package goods and educational experience to TLC. Prior to joining TLC, Klein was vice president and head of the consumer clients group of Regis McKenna, Inc., a high-technology strategic marketing and communications company. Her client group included Apple Computer, Imagic, Electronics Arts and The Learning Company.

Previously, Klein held sales and marketing management positions with J. Walter Thompson, Hunt-Wesson Foods, and Procter & Gamble. Klein began her career as a college instructor.

Klein earned graduate degrees from Stanford University and the University of Santa Clara and her undergraduate degree from the University of Michigan.

MANAGER OF RESEARCH & DEVELOPMENT -- PETER ROWE -- Mr. Rowe brings to TLC years of management experience in leading software development projects. Prior to TLC, he was president of Computer-Advanced Ideas, which developed software for the California public school system and the Children's Television Workshop.

He has also served as a consultant to and designed instructional software packages for Apple Computer. From 1968 to 1979, he had various responsibilities at Lawrence Hall of Science, including conceiving and co-directing the computer operations and developing computer-assisted instruction for the California School for the Deaf, Berkeley and school districts nationwide. Among his other accomplishments, Rowe designed software systems for the University of California, Nestar Systems and Mountain Computer.

Rowe holds an A.B. degree from the University of California at Berkeley, where he was awarded the President's Undergraduate Research Fellowship.

ANNEXE XI

Documentation sur Apple Cie

A WELL DESIGNED
EDUCATIONAL PROGRAM

A WELL-DESIGNED EDUCATIONAL PROGRAM:

Assumes The User Is Naive

Includes User/Teacher Documentation With Learning Objectives

Is User-Proof

Provides A Means To Escape Or Pause Mid-Exercise

Contains Descriptive Menus

Provides Immediate And/Or Non-Judgemental Responses

Gives Control Of Presentation Rate To Teacher/Student

Provides Branching Routines And Random Presentation

Has Appropriate Correct Responses

Focuses On Defined Objectives

Makes Appropriate And Creative Use Of Graphics

Contains Screen Display Designed For Ease Of Viewing

Is Accurate Pedagogically

Avoids Excessive Typing And Repetative Choices

Has Print Option When Instructions Are Lengthy

Is Edited For Maximum Quality Presentation

Initiates New Roles Or Tasks Beyond Existing Media

Has Significant Impact On Nature Or Quality Of Curriciulum

THE APPLE EDUCATION FOUNDATION

APPLE CANADA EDUCATION FOUNDATION

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ANNEXE XII

Documentation sur L'ACCCEL

ACCCEL
Assessing the Cognitive Consequences of Computer Environments for Learning

a joint project of

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OVERVIEW OF THE ACCCEL RESEARCH PROGRAM

Extensive use of microcomputers in schools, homes, banks, supermarkets and many other settings make computer learning an important and immediate issue in education. If many of the claims about computer learning are true, the use of microcomputers may herald profound changes in the structure of education. It is already clear that microcomputers are and will be used for educational purposes. Perhaps the important questions at this point are, what are the cognitive demands placed on learners, and what are the consequences of learning activities conducted in a computer learning environment?

There are several classes of cognitive consequences that may result from computer learning experiences. Two of these classes are (a) acquisition of subject matter knowledge, and (b) acquisition of thinking and logical reasoning skills (higher cognitive skills). Although the learning of subject matter knowledge is clearly important, it is not addressed directly in this research program. Our focus is on the acquisition of higher cognitive skills as a result of learner activity in computer learning environments. The higher cognitive skills in which we are most interested are (a) strategic planning knowledge, (b) inductive reasoning, and (c) deductive reasoning.

What is it about computer learning environments that can be expected to influence the acquisition of higher cognitive skills? In what ways do computer learning environments differ from other learning environments that could lead to changes in higher cognitive skills of learners?

Our analysis of computer learning environments proposes six characteristics of these environments which, by theory or previous research, appear to be related to acquisition of higher cognitive skills. The characteristics are: (a) interactiveness; (b) precision; (c) consistency; (d) challenge; (e) complexity; and (f) provision for multiple solutions.

The impact of these characteristics of computer learning environments on higher cognitive skills is expected to depend upon two classes of factors. First, learners differ in aptitude and therefore may acquire differential skills and knowledge from computer learning experiences. Second, learners who differ in cognitive style variables also may acquire higher cognitive skills in different manners or in different degrees as a result of experience in computer learning environments. The focus of the research is refined further to investigate the acquisition of higher cognitive skills as a result of learner activities in computer learning environments, taking into account learner differences in aptitude and cognitive style variables.

Thus, the central framework of the research program examines how learners who differ in aptitude and cognitive styles, and with respect to experience in computer learning environments, differentially acquire higher congitive skills and knowledge.

Within this framework, we have identified three classes of computer learning environments that seem to warrant investigation. The three classes are: (a) computer programming environments (the learner uses a "language" to program the computer); (b) educational simulations and games (the learner "controls" various elements in order to attain single or multiple goals); and (c) subject matter presentation and practice routines. These environments differ in the extent to which one or more of the six characteristics of computer learning environments are manifested, and therefore in the kind and extent of influence learner experience in these environments may have on higher cognitive skills acquisition.

The first two classes of environments, computer programming and educational simutations and games, make extensive use of the six characteristics of computer learning environments and therefore may have substantial impact on higher cognitive skills. The third class (subject matter presentation and practice routines) is a direct translation of traditional instructional procedures and may be less likely to enhance higher cognitive skills. For this reason, we are considering computer programming and educational simulations and games as the two classes of computer learning environments most relevant to the pursuit of the specified research objectives.

Regardless of the class of computer learning environment, many other treatment conditions are likely to affect higher cognitive skills. For example, the degree to which strategic planning knowledge (or structured programming conepts) is made explicit may be a critical dimension in determining what and how much is learned. Therefore, we systematically include instructional treatments at two levels of explicitness in each of the computer learning environments proposed for study.

The current phase of the ACCCEL research program consists of eight interrelated studies to be conducted between January 1983 and January 1985. The studies are divided into two groups: Series A studies and Series B studies.

The studies in Series A examine the demands and higher cognitive consequences of learning computer programming. Series B studies examine the higher cognitive consequences of learner activities using educational simulations and games. Both series have been designed carefully to include the same (or similar) aptitude, cognitive style, and instructional treatment variables, as well as similar outcome variables (on both near and far transfer tasks). In these interrelated studies, we examine the acquisition of higher cognitive skills for learners of different: (a) ages (ten-year-olds and junior high school-age students); (b) socioeconomic background (low and medium levels of SES); (c) computer-related experience (no experience and previous instruction using computers); (d) gender (male and female); and (e) previous achievement level. We also examine the acquisition of higher cognitive skills when the computer environment is housed in different settings (schools, museums, and other settings). In addition, within the Series A studies, we will explore three programming languages (BASIC, Pascal, and Spider); within the Series B studies we will examine the use of several educational simulations and games (Creative Play, WUMPUS, Rocky's Boots, and the Yellow Light Problem).

In order to incorporate each of the factors discussed above in the overall design of the ACCCEL research program, two main studies and a series of smaller studies will be conducted. The smaller studies extend the main studies by examining carefully chosen treatment groups representing combinations of the factors discussed above.

More extensive information on the background and rationale for the research program is provided in the research proposal[1]. A list of documents associated with the ACCCEL research program is included as Table 1.

The current document presents the research designs for two of the Series B studies, the WUMPUS study and the Rocky's Boots study. The WUMPUS study is presented first and represents the major study in the B series. The WUMPUS design is relatively elaborate, incorporating most of the issues being addressed in the overall ACCCEL research program. The second portion of this document presents the design for the Rocky's Boots study. This study examines many of the same issues using a more informal research methodology. Within the overall framework of the ACCCEL researh program, the WUMPUS study is closer to an hypothesis-testing activity while the Rocky's Boots study represents an hypothesis-generating activity.

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[1] Information on the ACCCEL research proposal is available from the ACCCEL program offices at Lawrence Hall of Science, University of California, Berkeley, California or Far West Laboratory for Educational Research and Development, San Francisco, California.

TABLE 1

Reports and Due Dates for the ACCCEL Research Program

TENTATIVE REPORT TITLE	TASK	DUE DATE	
		DRAFT	FINAL
1. Literature Review on Cognitive Demands and Requirements of Computer Programming	1	Mar. 31, 1983	Oct. 30, 1983
2. Research Design for Studies on the Acquisition of Higher Cognitive Skills from Learning Computer Programming (Series A Studies)	2-3	Jul. 31, 1983	Aug. 31, 1983
3. Final Report on the Requirements for Learning from Computer Programming	2	--	Jun. 30, 1984
4. Final Report on the Acquisition of Higher Cognitive Skills from Learning Computer Programming	4	--	Sep. 30, 1984
5. Cognitive Requirements and Benefits of Learning Computer Programming	5	Dec. 15, 1984	Jan. 9, 1985
6. Selection of software for Studies of Acquisition of Higher Cognitive Skills from Computer-Assisted Learning	6	--	Apr. 15, 1983
7. Review of Research on the Cognitive Effects of Computer-Assisted Learning	7	Jun. 30, 1983	Jan. 30, 1984
8. Research Design for Studies of Acquisition of Higher Cognitive Skills from Computer-Assisted Learning	9	Studies B1 & B4 Studies B2 & B3	Mar. 15, 1983 Nov. 30, 1983
9. Final Report on Acquisition of Higher Cognitive Skills from Computer-Assisted Learning	10	--	Jan. 9, 1985

Marcia C. Linn & Joanne S. Stein

Assessing the Cognitive Consequences of
Computer Environments for Learning (ACCCEL)
Lawrence Hall of Science

The gap between the promise of computers in education and the reality of their use in classrooms is widening. Before a national magazine concludes that the use of computers in schools is a case of "macro expectations and micro outcomes" this gap must be narrowed. If steps are not taken to increase the effectiveness of computers in schools, it is likely that the outcome of computer education programs will be minimal. Unless decision makers are informed about the problems and barriers which prevent effective use of computers in classrooms, it is conceivable that computer technology will lose the opportunity to influence educational practice without the benefit of a fair trial.

Already within the educational community, frustration is mounting. At a recent computer conference an educator

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This material is based on research supported by the National Institute of Education. Any opinions, findings and conclusions, or recommendations expressed in this publication are those of the author and do not necessarily reflect the views of the National Institute of Education.

confronted one of the representatives at close quarters. "I want you to show me what this does", he demanded, referring to a popular introductory language. The rep launched into her well-oiled demonstration. Suddenly the teacher interrupted with an urgency in his voice. "No, wait", he said, almost pounding his fist on the monitor, "I've seen it draw the square... what I want to know is what does it do?". Understand, this man was not some educational Neanderthal trying to pick a fight, he was genuinely troubled. He had seen the articles and read the books. he knew, as we all do, that computers constitute nothing short of a revolution, one which holds immeasurable promise for transforming and improving education and society. And he had wanted to believe. But here was the amazing computer and it was... well, it was drawing a square.

It might be easy to be led to the belief that computers are nothing more than, as at least one teacher is fond of putting it, "three-thousand dollar machines doing the job of forty-nine cent workbooks". This is often the extent of their classroom application. Computers are tools in much the same way that pencils are tools: the potential is tremendous but the realization of that potential requires both financial and intellectual resources.

The roots of educator frustration in this regard are not hard to unearth. One teacher we visited showed us the walls she had painted, and the materials she had laboriously culled from various sources to start her school's computer program from scratch. Another outlined the fund raising drives he had organized, a campaign of military proportions, and added, " The school district's contribution was the electricity." These cases are not atypical but symptomatic. A meeting of university presidents and education-school deans recently concluded that, "As a nation, we ask a great many different things of our schools, and often fail to provide them with the resources to fulfill our expectations.

Few would argue that computers are a powerful tool which can dramatically change the practice of education in our nation's schools _if_ the educational software to affect that change and the teacher training to implement the change are actively pursued. Intellectual energy and financial resources are required for this to occur. When the National Science Board Commission of Precollege Education in Mathematics, Science, and Technology called for "new basics: the thinking tools of communication, higher problem solving skills, and science and technological literacy", it was also careful to point out that funding would be needed for instructional implementation and even went so far as to suggest sources and amounts. Other national commissions have agreed on the vital need for a "learning society" filled with skilled problem solvers, a need which demands that we attempt to use the powerful technology of computers effectively.

When schools do manage to obtain computers, a "buy now, plan later" mentality concerning computer decision making, compounded by lack of effective teacher training programs and a dearth of good quality educational software has gravely compromised the undertaking. Is the nation therefore at risk, or are computers in schools simply another short-lived diversion? Do they draw figures or draw out minds?

One way of describing the "drawing" power of computers is in terms of cognitive demand. That is, to what extent do they engage higher cognitive skills? These skills, including the ability to plan an effective problem solution and to revise or "debug" that plan in light of feedback or new information, are crucial for success in our society. Education programs which foster planning and debugging are difficult to develop and carry out. Frequently they require special equipment and/or individual tutoring of students. As a result these important skills are addressed in only a small proportion of the curricula.

Computers are uniquely well-suited to teach higher cognitive skills such as planning and debugging. Planning involves deciding how to combine a set of activities to accomplish a complex goal. In programming, [illegible] required to plan when they must combine a set of language features to solve a non-trivial problem. This activity, in fact, lies at the heart of programming. It is very difficult to haphazardly design a program which will print Pascal's triangle, for instance. Instead it is necessary, first, to understand the sequence of mathematical operations required to generate the triangle. Next the student must translate this algorithm into terms a computer can make use of. She must then arrange for the computer to print the results in the familiar triangular format. Inevitably, solution will require testing and revision. The computer will provide instant feedback and enable the student to work autonomously toward her goal of a fully functional program.

In programming, as in other uses of computers in education however, the gap between the promise of programming instruction and the reality of classroom programming activities is apparent. A large portion of computer classrooms focus on the language features used to program rather than on planning or debugging. Students learn the meaning of words such as GOTO, or BEGIN and END. They do not learn how to combine these words into plans. Just as instruction in foreign languages cannot be limited to the acquisition of vocabulary, so instruction in computer programming cannot be limited to the acquisition of language features. Programming is cognitively demanding only when students are required to plan unique and effective combinations of the language which they have learned and to debug complex programming statements. One of the features of the computer environment which differentiates it from other learning experiences in schools is the possibility of this complexity. Unless this complexity is brought on-line, the value of the tool will be unjustifiably limited.

The gap between the promise of computers in education and the realities of their use in classrooms is partially the result of inadequate funding for the training of teachers. Teachers need to examine where current training monies in their districts go and to group together to demand that those monies be spent addressing crucial concerns in computer education such as the ones we have been discussing. If the decision process for the expenditure of teacher training monies is not responsive to teacher needs, then our nation's schools are in serious trouble. The development of quality teacher training programs depends inexorably upon the availability of funds in schools. With appropriate resources, teacher training programs can flourish and can be continuously upgraded in response to innovations.

Fortunately, despite the difficulties involved many individual computer education professionals have developed effective, challenging, and useful classroom activities and procedures. This important source of information can be tapped with relatively minor expense by the networking of computer education professionals. An effective way to increase future expertise in computer education is to encourage such networking.

Expert computer education teachers can increase their expertise by sharing their ideas with other teachers. Much recent cognitive psychological research has revealed that the knowledge of experts is frequently tacit. Researchers have requested that experts in many different problem solving domains make their tacit knowledge explicit by examining the procedures that they use for solving complex problems. This approach has resulted in effective descriptions of the problem solving procedures of experts. These procedures can then be communicated to other individuals interested in solving problems in the same domain. Such an approach would seem especially effective for computer education. Expert teachers can be encouraged to make the procedures which they use explicit and then to share those procedures. As the experience of the Bay Area Writing Project and the Bay Area Mathematics Project demonstrate, when expert teachers share ideas, everybody benefits.

Universities can also help. Many universities have been investigating factors which influence the effectiveness of computer education programs in schools. For example, at the Lawrence Hall of Science, at the University of California at Berkeley we have a project called Assessing the Cognitive Consequences of Computer Environments for Learning. This National Institute of Education funded project has been investigating factors which foster cognitive outcomes in computer education. Many of the findings of this research project will resonate with the insights of expert teachers. As expert teachers specify their procedures for teaching, it will be possible to combine that explicit knowledge with the results of research investigations to generalize the outcomes even more widely. Thus, by making their expertise explicit, teachers also develop a language which allows them to incorporate research findings into their educational programs. In addition, this language facilitates the communication between teachers and researchers and forges the sort of links between research universities and schools which ultimately are essential for the success of the educational enterprise.

Networks of teachers have power. As a group, teachers can encourage the development of the sorts of software and instructional materials which will promote their educational goals. Networks can evaluate available materials and reach consensus about the sorts of materials they would like to see more often. They can share their consensus with their colleagues and have an impact on the sales of effective materials. In addition, they can directly endorse materials which they find effective and can encourage publishers and curriculum developers to devise materials which are useful to them.

Evaluation of software requires a reasonable level of expertise. Although teachers, principals, and administrators have developed excellent skills in browsing through books, the skills required for browsing through software are in their infancy. Educational programs and workshops are needed to develop these skills. The procedures used by expert teachers for selecting effective software need to be made explicit so that they can be used by teachers who have not developed them. This could become a function of a network of teachers and obviously could be considerably more effective if resources were available to the group.

Networks of teachers can influence universities to develop pilot materials in the areas which they see as most promising. The Lawrence Hall of Science has been responsive to teacher initiatives in many different areas. Members of the University of California research staff regularly participate in teacher networks.

With limited funding, computer education can be improved. Networks provide both the power and the opportunity for influencing change. By sharing ideas, everybody's knowledge is improved. By linking universities and local schools the quality of education will be fostered.

With extensive funding, more comprehensive change is possible. Teacher workshops can be used to develop expertise in new areas. Curriculum materials can be adapted to the needs of teachers. Ideas and plans for new curricula can be developed. Courses to ensure the equitable access of students to computer learning can be designed and implemented.

ANNEXE XIII

Documentation sur Pacific Studies Center

SILICON VALLEY:
Paradise or Paradox?

The Impact of
High Technology Industry
on Santa Clara County

SILICON VALLEY:

Paradise or Paradox?

The Impact of
High Technology Industry
on Santa Clara County

This pamphlet was prepared for the Pacific Studies Center by Alan Bernstein, Bob DeGrasse, Rachael Grossman, Chris Paine and Lenny Siegel, in October 1977.

For more copies, write or phone the Pacific Studies Center, 222B View Street Mountain View, CA 94041 (415—969-1545).

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6. Taxes and Services 51

Introduction

> The "Fruit Bowl of America," fertile Santa Clara Valley, has come of age. Suburbs, shopping centers, freeways and industrial parks are marching through the orchards that until recently produced half the world's prunes and a bounty of apricots, cherries and walnuts.
>
> —Living in Santa Clara County, Bank of America

Within the past twenty five years, Santa Clara County has developed from a peaceful valley of orchards and canneries into a suburban metropolis of sprawling towns and a center of high technology industries. The county has changed rapidly, but the coming of age brings problems as well as maturity. Growth and development, has brought prosperity to many people, but has also spurred severe urban problems and accelerated environmental decay. The image of industrial parks marching through orchards is appropriate, for local corporations have become a center of the war industry. The expansion of industry has also introduced new hazards for people working in high technology firms.

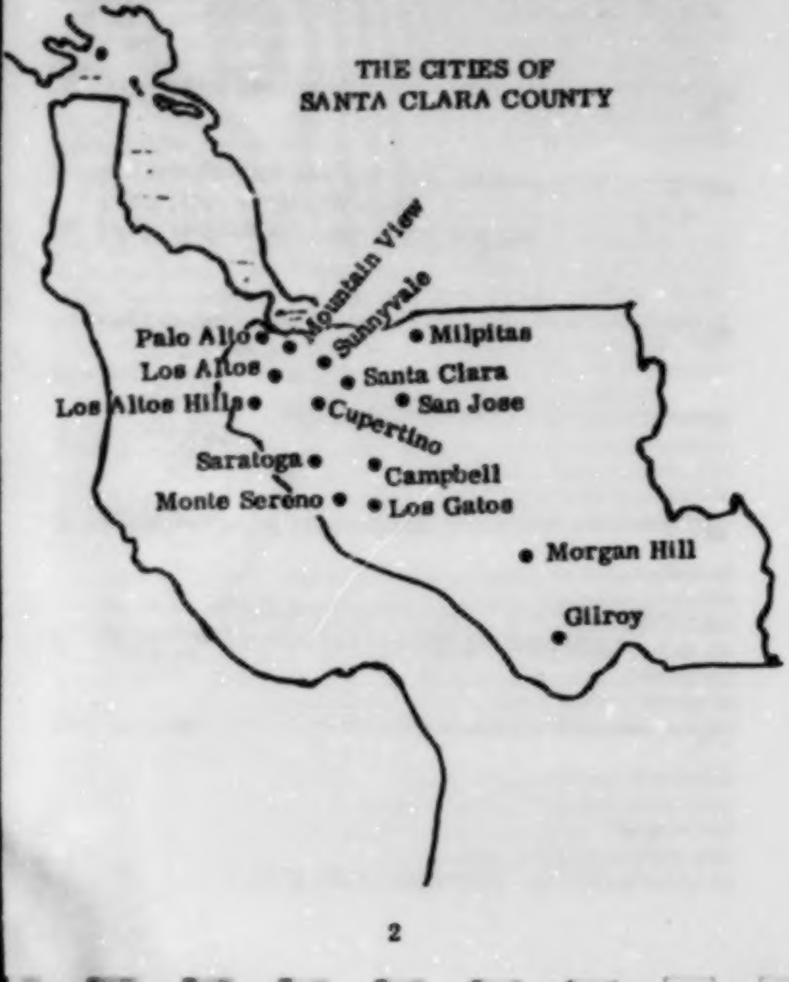
Santa Clara County, which opens out from the southern end of the San Francisco Bay, is one of the fastest growing regions in the United States. Population, now 1,200,000, has nearly doubled since 1960. Economic development as well as population growth has been concentrated in the northwest part of the county, extending from Palo Alto in the north, to San Jose, the county seat and population center. In 1956, San Jose covered 22 square miles. Today it spreads over 140 square miles of surrounding land. The southern towns of Morgan Hill and Gilroy, while still predominantly rural and agricultural, may soon become "bedroom communities" housing workers employed in North County cities.

Santa Clara County is one of the most affluent counties in the nation, having a strong economic base in the electronics industry and a median family income of $18,500 in 1976. Wealthier residents enjoy the elegant homes and tree-lined streets of Palo Alto, as well as the rural luxury of Los Altos Hills. The area has a pleasant climate all year long, and a beautiful landscape of foothills and plains.

Prosperity and growth have flowed directly from the expansion of high technology industries in Santa Clara County. Originally spawned by Stanford University's Engineering Department, the industry is composed of hundreds of firms located mainly in Palo Alto, Mountain View, Santa Clara, and Sunnyvale. Manufacturers specialize in state-of-the-art innovations in semiconductors (the building blocks of computers), and military, medical, and consumer electronics.

Local high technology industries are generally touted as the key to a future technological paradise as well as the guarantor of prosperity. This pamphlet will examine other aspects of the industry not usually dealt with in the laudatory feature stories in business journals and newspapers.

Approximately 200,000 people are directly or indirectly dependent on the industry for jobs, according to the Employment Development Department. High technology firms employ many scientists, engineers and managers who enjoy a high standard of living. On the other hand, the large number of blue-collar workers in the industry, often non-white women, face comparatively low wages, frequently unhealthy working conditions and periodic layoffs.



THE CITIES OF
SANTA CLARA COUNTY

The rapid expansion of industrial parks and electronics plants has accelerated the process of urban sprawl, covering the old orchards with low-density factories and tracts. Because industry has chosen to concentrate in the northwest county, and cities provided more land for industry than housing, many employees, particularly lower income workers, are unable to find housing near their jobs. This has created a housing shortage and has also helped to drive up housing costs. The housing and employment pattern has increased commuting and heavy traffic flows snarl local highways and roads. Increased automobile use has intensified local pollution problems.

The imbalance of housing and jobs also affects the distribution of taxes and services in the county. Northern cities have a good industrial tax base, plus the benefit of not having to provide services to the employees of corporations who live elsewhere. Cities to the south however, lacking a lucrative tax base, are given the additional burden of providing services to the workers of North County firms.

Most residents of Santa Clara County are familiar with the problems they face: pollution, housing, taxes, job security, local over-dependence on military spending, etc. Solutions to these problems are seen very specifically: enact stricter legislation, build more housing, organize a union. Issues are addressed as isolated problems and the result is a patchwork of individual and inadequate solutions. By demonstrating that these problems have common origins in the development of high technology industries, we hope to aid the process of finding integrated solutions approaching these problems as part of a unified process.

The questions underlying these issues concern the fundamental distribution of power in our society; in this case business being left alone to make decisions which have socially harmful consequences. This study is not simply meant as an exercise of finger-pointing at business, for individual city governments, through short-sighted and self-interested policies, as well as educational institutions, played crucial roles in the formation of these problems. However, it is only by challenging unquestioned business prerogatives and asserting the public right to control processes which shape how we live and work that we can ever achieve more than partial and temporary solutions to the problems which we face.

History and Structure

The remarkable concentration of high technology industry in Santa Clara County is far from accidental. Entrepreneurs chose the area because, in addition to a naturally pleasant climate, it offered a combination of land, labor, technological resources, financing, and access to markets. These factors were not always present, so the history of the electronics industry and other modern production here is in fact the story of all those elements.

In the early 19th century, Santa Clara County primarily produced animal products, but by 1870 it was one of the nations leading wheat-growing areas. The completion of the transcontinental railroad — and a spur to San Jose — in 1869 brought populated markets "closer" to Santa Clara County, enabling the transformation of the county into a prime producer of fruits and vegetables, notably apricots and prunes.

The railroads had a further-reaching, but less direct impact upon the county. Railroad tycoon Leland Stanford bought Rancho San Francisquito, at the northern edge of the county, and bred race horses there. When his son, Leland Stanford Jr. died in 1884, Stanford and his wife Jane determined to create a university in his memory on the farm site. The doors of Stanford University opened in 1891. Endowed with the Stanfords' fortune and the land of the 8800-acre stock ranch, Stanford University developed into one of the nation's top universities.

For its first half century, Stanford University retained somewhat of a country club atmosphere. It received national prominence in 1928, when alumnus Herbert Hoover was elected president, but not until the years after World War II did the university evolve into the primary engine of local industrial development.

Events in the first half of the century, however, foreshadowed the post-war industrial complex. In 1909 Stanford graduate Cyrus Elwell formed the Federal Telegraph Company (FTC), in Palo Alto. Financed by Stanford officials and faculty, Lee de Forest of FTC invented the vacuum tube, the original building block of the electronics industry. FTC moved to New Jersey in 1931, and FTC engineers went on to establish what later became Litton Industries and Magnavox.

During the 1930's, Stanford engineering professor Frederick Terman, Jr. encouraged his students to establish their own electronics firms rather than migrate to the east coast. Terman had developed an appreciation of the benefits that universities and industry could share when he did his graduate work at M.I.T. In 1936 Terman student John Kaar formed Kaar Industries. During World War II Kaar was the leading west coast builder of two-way radios, but the company is no longer in operation.

In 1938 Terman helped Bill Hewlett, who designed an audio oscillator, and David Packard form a company in a Palo Alto garage. Crocker Bank loaned the two engineers $1,000 to start production. Hewlett-Packard's first big order came from Disney Studios, which wanted nine oscillators to produce the stereophonic sound for *Fantasia*. H-P not only grew to be the world's largest manufacturer of electronic measuring equipment, but it became a pace-setter and leader of Santa Clara County industry.

In 1937 Stanford's physics department offered lab space to Russell and Sigurd Varian. There the Varian brothers developed the Klystron tube, an essential component of radar. Though the Varians did not establish their own electronics company until after World War II, the university reaped immediate benefits in the form of royalties for the invention.

World War II had a dramatic impact on the entire Bay Area. Local industries, from canned vegetables to shipbuilding to electronics geared up for the Pacific war. San Jose-based Food Machinery and Chemical Corporation (FMC) transformed its factories from the assembly of tractors to tank production.

PERMANENT WAR ECONOMY

At the end of World War II, national leaders determined to continue the war economy. The Federal government funded the continued development of aircraft and electronics, and the Korean War, which broke out in 1950, re-fueled the west coast assembly lines. Though World War II mobilization had passed Stanford University by, the university was prepared to take full

advantage of "post-war" military spending.

First, in 1946, Bay Area financial and industrial leaders joined university officials to establish the Stanford Research Institute, in Menlo Park, at the southern end of San Mateo County. Though SRI's chief function was to conduct applied research for California industry, the institute ended up doing more work directly for the Department of Defense.

Also, at the end of World War II Terman returned to Stanford from Harvard's Radio Research Laboratory. From that lab he recruited several promising engineers, building Stanford's electrical engineering department into the nation's best. In 1948 Stanford faculty members teamed up with the Varian brothers, who had also returned from the east coast, to establish Varian Associates.

The pleasant climate of Santa Clara County helped create the suburban lifestyle which many young scientists found addictive. The professionals, who provided the brainpower essential for the development of high technology industry, found it hard to leave the area.

The climate, SRI, and the engineering school might have propelled Santa Clara County into the space age without further planning, but the conscious vision of Frederick Terman established the Peninsula as America's leading center of high technology industry. "We have been pioneers in creating a new type of community, one that I have called a 'community of technical scholars,' " he explained. "Such a community is composed of industries using highly sophisticated technologies, together with a strong university that is sensitive to the creative activities of the surrounding industry. This pattern appears to be the wave of the future."

Stanford Engineering School

As Terman rose to become dean of the engineering school and provost for the entire university, he provided local industry with more than bright young graduates and helpful faculty consultants. In 1951 the university leased a section of its vast lands to Varian Associates, and the following year it leased to Hewlett-Packard as well. In 1954 the university board of trustees announced a formal policy, the development of an industrial park for high technology industry on Stanford lands.

Stanford's landscaping standards, making factories and private research buildings resemble campus buildings, not only increased the attractiveness of employment in the industrial park, but it set a standard for light industrial development throughout the Bay Area.

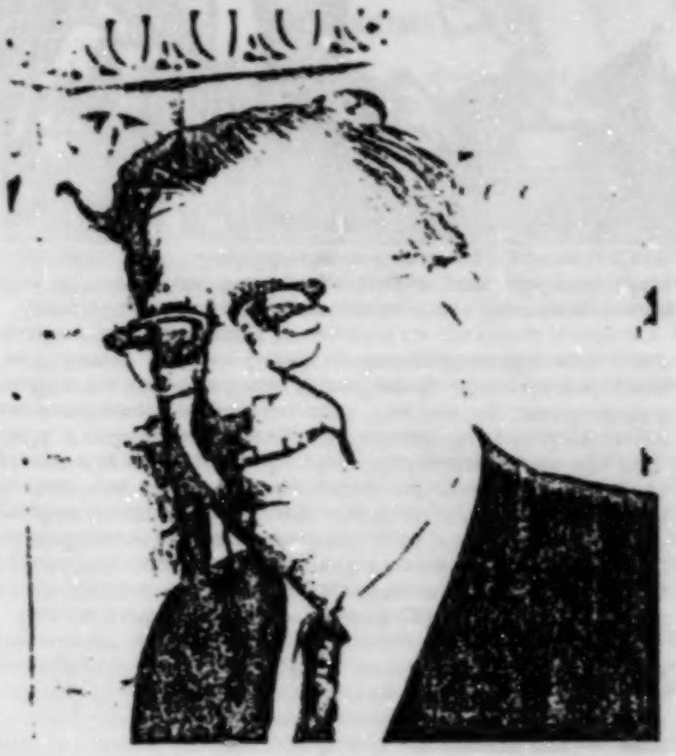
In addition, the engineering school pioneered in providing continuing education for engineers. Hundreds of professionals in local industry took courses at Stanford through the Honors Cooperative Program, which established its own television network — providing on-the-job classes — in 1969.

Continued military spending and the beginnings of the space race fueled the growth of new Stanford spin-offs. Typically, university scientists would develop an idea for production and establish a plant in the industrial park. Some companies, such as Watkins-Johnson, would develop into major companies in their own right, while others, including Applied Technology and Microwave Electronics, would eventually be swallowed up by national corporations — Itek and Teledyne respectively.

As the complex grew in the 1950's, it attracted major firms from other parts of the country. Sylvania (GT&E), Philco, and GE set up plants in Santa Clara County. In 1956 Lockheed set up a research laboratory in the Stanford Industrial Park, and it liked Santa Clara County so much that in 1957 it purchased 700 acres in Sunnyvale for its new Missiles and Space Division. As prime contractor for Polaris, Poseidon, and Trident undersea missile systems, Lockheed has been the county's largest military contractor and greatest employer. Lockheed official Douglas Moffat reported, "We moved to get better access to the right sort of manpower so that we could establish a working environment with the right intellectual atmosphere." In Sunnyvale, Lockheed found it much easier to recruit scientists and engineers then back in Burbank.

By the early 1960's, the industrial complex that grew from Stanford was a power on its own. Local firms plowed money back into Stanford, particularly for the construction of engineering and science buildings, and officials of Santa Clara County corporations -- especially Hewlett-Packard — were appointed to the Stanford board of trustees.

Stanford continued to germinate high technology firms, making Santa Clara County a center for the production of lasers, data processing equipment, magnetic tape equipment, medical instruments, and modern pharmaceuticals, as well as military electronic systems and electronic components. Once the major firms were in place, they attracted and spun off numerous smaller firms, which took advantage of Terman's "community of technical scholars" but had few direct ties with the university. The proliferation of high technology firms has been most evident in the development of the semiconductor industry, the largest industry (by employment) in the county.



Frederick Terman

SEMICONDUCTORS

William Shockley, one of three scientists who invented the transistor at Bell Labs in 1947, returned home to Palo Alto and Stanford in 1955 to form the Shockley Transistor Corporation, with backing from Beckman Instruments. Shockley recruited a number of talented young engineers, but he was incapable of managing them. Eight leading Shockley officials left the pioneer company in 1957, arranged financing from Fairchild Camera and Instruments Corporation of New York, and founded Fairchild Semiconductor in Mountain View.

Fairchild went on to become the leading semiconductor manufacturer in the valley and one of the nation's "big three." Dwarfed by the new division, Fairchild Camera moved its corporate headquarters to Mountain View in 1968. Eastern management and western technologists have not always seen eye-to-eye at Fairchild. Consequently, many engineers and scientists, including the original eight from Shockley, have left the corporation over the years to establish companies in which they have more direct control. Today, nearly all of Santa Clara County's semiconductor manufacturers can trace their ancestry to Fairchild.

The first general manager at Fairchild, Ed Baldwin, left after only one-and-one-half years to form Rheem Semiconductor, backed by the New York-based diversified manufacturer. Litigation over the theft of trade secrets handicapped the new company, which survives today as Raytheon's semiconductor division, down the street from Fairchild in Mountain View.

In 1961, a group of Fairchild scientists formed Signetics, which became a subsidiary of Corning Glass Works. In 1967, Massachusetts investor Peter Sprague recruited Fairchild general-manager Charles Sporck and other key personnel to head National Semiconductor. They quickly built this losing company into an industry leader. In 1968, Robert Noyce, head of Fairchild Semiconductor, and Gordon Moore, another of its founders, left to form Intel. Starting from scratch less than a decade ago, Intel is now among the top five integrated circuit makers in the country. Fairchild Camera selected a new president, Lester Hogan, who took direct control of the semiconductor operations and brought in his own top staff from Motorola. When Hogan removed Jerry Sanders from his position as head of marketing, Sanders and a group of seven others formed Advanced Micro Devices.

Many more firms formed in the late 1960's and early 1970's. Since brainpower is the most important factor in the semiconductor industry, it was not difficult for promising scientists and engineers to set up their own firms when conditions at larger companies became undesirable. The concentrated technological complex made such spin-offs easy, since entrepreneurs could hire assistants and consultants proficient in management and electronics, lease appropriate industrial space, and contract out for data processing and other services. Satellite firms, specializing in semiconductor processing equipment and materials — silicon chips, printed circuit boards, chemicals, etc. — were always pleased to serve new clients. Stanford continued to crank out engineers and scientists, versed in the latest technology through their campus research projects — funded by the Defense Department and other federal agencies.

But the new industry also needs large amounts of unskilled assembly labor. The highly competitive manufacturers, anxious to hold down costs, liked Santa Clara county because there was no tradition of electronic workers' organization. The only comparable scientific community, the Route 128 complex around Boston, was surrounded by unionized consumer electronics plants. It is no surprise, therefore, that eastern firms like Fairchild, Raytheon, and Sprague's National chose to develop the semiconductor industry out west. The two top semiconductor makers not based in Santa Clara County, Motorola and Texas Instruments, are also based in the traditionally non-union southwest of the country.

Competition among U.S. companies drove them to seek even cheaper labor than the unorganized women of Santa Clara County. In 1963, Fairchild extended its assembly lines to Hong Kong. Today it has plants in five Far Eastern nations, all of which specialize in unskilled assembly of products fabricated in the U.S. Even the smaller manufacturers of semiconductors in Santa Clara County take advantage of the dramatically lower wage rates at foreign shops.

Shockley, Noyce, and colleagues in 1957

FINANCING

Stanford, the Santa Clara County climate, and the suburban life-style attracted the technologists who built the industries of Santa Clara County, but throughout the history of the high technology complex, most of these entrepreneurs have had to go outside the county for financing. The funding of new ventures, known as "venture capitalism," is a risky business. Most investors prefer to sink their money in bonds, blue chip stocks, and real estate. The banks, corporations, and individuals who have backed Santa Clara County industry have been willing, however, to back these innovative companies in the expectation that they might be buying into "another Xerox."

The first semiconductor producers, Shockley, Fairchild, and Rheem, were all backed by industrial firms from outside the area — Beckman, Fairchild Camera, and Rheem Manufacturing. New York investment bankers originally financed Signetics, but it sold control to Corning Glass. New England investor Peter Sprague built up National Semi with his own fortune. The Bank of America provided Memorex, the Santa Clara manufacturer of magnetic tapes and computer equipment, with the bulk of its financing. The *Wall Street Journal* reported that the B of A's loans to Memorex were perhaps the bank's largest single commitment.

As the early firms spun off competitors, the complex developed its own financing system. The major San Francisco banks established offices in Santa Clara County, where bankers versed in the new technologies still weigh the proposals of venturesome scientists. While the banks provide loans, investment groups that specialize in venture capitalism buy stocks. Though most venture capital firms represent individuals or families, Exxon Enterprises has invested oil profits in Zilog.

By the mid-70's, however, most of the financing of new ventures had dried up. According to investors, new tax laws and government regulation had taken away some of the incentive. In addition, the cost of starting a semiconductor firm had risen from about $1 million in 1966 to $6 million in 1977. Venture capitalists started looking for more mature enterprises, and the pace of new incorporations has slowed down considerably. Existing firms still attract financing, however. For instance, in June, 1977 Prudential Insurance provided old-timer Fairchild with an expanded line of credit.

The technological superiority of the American electronics industry has opened up new sources of funds. Foreign electronics firms have bought into Santa Clara County to gain access to American technology. In 1972 Fujitsu, a major Japanese computer maker, provided Amdahl Corporation with funds to compete, head-on, with IBM in the large mainframe computer business. In 1976 the Dutch electronics giant Philips bought the foundering Signetics from Corning Glass, and in 1977 Siemens, the German multinational, bought a controlling interest in bankrupt Litronix and purchased a large block of stock in Advanced Micro Devices.

Santa Clara County still contains a large number of small electronics manufacturers, interspersed with H-P, Sylvania, Intel, Itek, etc. The small companies, however, are not independent small businesses. They are closely tied to major banks, venture capital financiers, and other, larger corporations.

STRUCTURE

The American economy can be divided into three basic categories. The public sector includes government operations — such as local schools, military bases like Moffett, and special facilities like Ames Research Center. It also includes private firms that do most of their work on government contracts, such as Lockheed, ESL, and the local branch of Sylvania. Within the electronics industry, public sector firms depend on the federal budget. In general, they have grown with the government's commitment to aerospace, and they have lost ground when weapons systems have been abandoned. They stand to gain as the military increases its reliance on electronic weaponry. Responsible to a government susceptible to pressures from organized labor, government contractors — Lockheed, for instance — are frequently unionized.

A second sector of the U.S. economy is generally called the monopolistic sector. This consists of industries — automobile manufacturing, for instance — in which a few companies dominate the market. Within the monopolistic sector, technology is stable and competition is confined to advertising and minor product variation. Though monopolistic firms — such as GE in San Jose — are generally unionized, this is not the case in the heart of Santa Clara County's electronic complex.

Among local companies, Hewlett-Packard, Varian, and Litton Systems are "monopolistic," by virtue of their stable shares of their prime markets. However, all three do substantial production for the government and H-P products compete with the semiconductor industry. Within the semiconductor industry, the production of discrete components such as transistors — the oldest solid state technology — is monopolistic, dominated by a few firms: Fairchild, Texas Instruments, and Motorola.

The competitive sector of the American economy consists of generally small businesses which fight for market shares through price competition. Even though somewhere above a third of the integrated circuits produced by the semiconductor industry are assembled into military products — that is, sold to the public sector — the market for solid state components is still extremely competitive. Historically, integrated circuit manufacturers, including the big three transistor producers, have priced new products below their own costs to establish their shares of the market. New firms with either new products or production technologies have quickly become serious contenders for the market. And once-profitable companies have folded, merged into larger ones, or have been re-organized because they incurred major losses.

In general, it is difficult for unions to become established in competitive firms because any company which pays higher wage costs than its competitors has trouble competing. While monopolistic GE can easily pay its workers more because it can hike prices — without losing sales — competitive companies cannot. For instance, should Fairchild offer substantial wage hikes, its higher prices (assuming the company maintains its profits) would shift consumption to its competitors. Therefore, semiconductor and other competitive electronics firms fight hard against unionization. Local electronics industry associations regularly sponsor seminars on preventing unions in the plants of members, and they provide legal aid to companies subject to organizing drives.

There are signs, however, that the industry is maturing. New technologies are appearing less frequently. As pointed out above, it is becoming difficult for unhappy engineers at one company to find financing to establish new competitors. As small companies merge into larger ones or fail outright, the industry will consolidate into the familiar monopolistic pattern. Prices will rise, and if the workers organize, wage levels will rise too. Eventually, innovation will decline.

The geography of Santa Clara County, federal contracts, venture capital, and the concentration of technological resources put together by Stanford University have built an industrial complex characterized by what Fortune's Gene Bylinsky has called "an innovative ferment on a scale without precedent in industrial society." Only now are the residents of the county recognizing that the glamorous electronics industry has brought some problems, too.

Stanford Industrial Park, circa 1967

Applications of Technology

The accomplishments of Santa Clara County companies are already legendary. *Fortune* writer Gene Bylinsky wrote:

> Utilizing components and entire technologies that didn't exist only a few years ago, they are fashioning the telephones and thermometers of tomorrow, electronic games, computerized process-control devices for a wide range of industries, and many other fabulous products.

Bylinsky's view is commonplace: that advanced technology is thrusting humanity into an era of unparalleled achievement.

In fact, however, the remarkable inventions and processes which the county is known for are oriented as much toward military destruction as toward social progress. As in the past, technology serves the existing social order. Instead of liberating humanity from meaningless labor, technology has increased specialization, centralization, and unemployment.

WEAPONRY

The most powerful institutions within society are the first to utilize new technologies. Since the 1950's, the government-funded aerospace industry — primarily those corporations producing weaponry — has been the major engine of American economic growth. Though some of the most important scientific breakthroughs of this era — transistors and lasers — occurred at the private Bell Telephone Laboratories, these innovations were put to work first by the Department of Defense, in the Minuteman Missile Program and laser-guided missiles. Military reconnaissance techniques predate even the long distance television techniques of the space program.

The Pentagon has led in the race for technology because it has been able to spend vast funds on university and think tank research — at places like Stanford and SRI — and contract to private industry to develop and produce expensive weapons systems. Since the early 1950's, when the Pentagon spent nearly $3 billion a year on research and development (R&D), the Federal government has supplied well over half of R&D funding in the U.S. By 1977, combined Pentagon and space program R&D funding had risen to $15 billion, two thirds of total federal science spending.

Locally, the Pentagon spends about $1.5 billion a year on weapons and military research. Though slightly less than half is officially categorized as "research, development and test evaluation," most involves advanced electronics or missile technology. The propulsion systems built by United Technologies and Trident missiles built by Lockheed involve complex technology, but their applications are clear. Most people, however, are unfamiliar with the growing role that electronics plays in modern warfare.

Military electronics can be lumped into several overlapping categories:

COMMUNICATIONS: The transmission of voice, scrambled voice (for secrecy), teletype, computer data, and television messages from the deepest submarine, highest satellite, and remotest foot patrol to the relevant base area, and back. Locally, Ford Aerospace is a prime contractor for one of the Pentagon's most sophisticated worldwide networks, the Defense Satellite Communications System, while Aydin Energy Systems manufactures AN/TRC-97 transportable radio terminals.

INTELLIGENCE: To keep track of "enemies" and potential enemies, the U.S. employs photography, infrared photography, radar, sonar, and a variety of radio listening devices which collect "enemy" radar and communications information. ESL in Sunnyvale specializes in Army intelligence equipment, and Watkins-Johnson in Palo Alto produces a large number of reconnaissance devices. GTE Sylvania, in Mountain View, produces detectors for the "electronics battlefield," a scheme which in Vietnam unsuccessfully kept track of NLF guerillas.

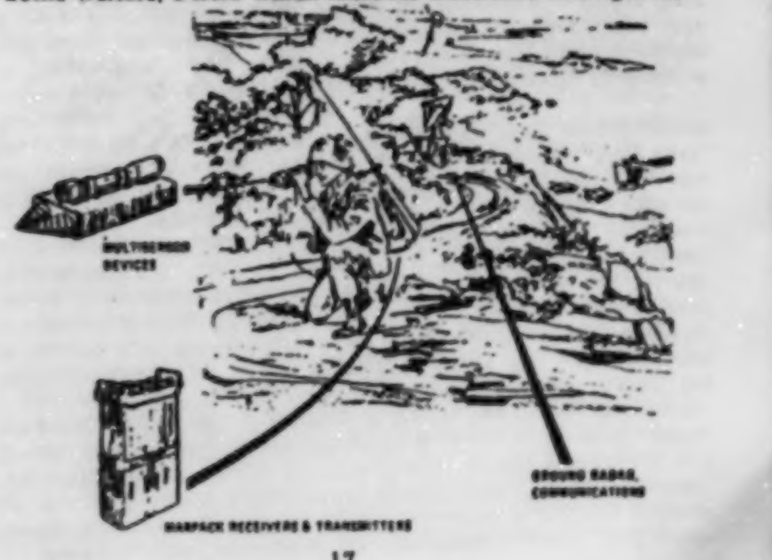
In addition, several local companies service the Air Force's "Satellite Test Center" in Sunnyvale, which processes intelligence data from satellites and outposts around the world.

NAVIGATION AND GUIDANCE: The armed services utilize a number of systems to help ships, planes and missiles stay on course. Within the last decade they have introduced "smart" weapons — bombs, torpedos, and other explosives which are guided to their targets by lasers, television cameras, or other pieces of sophisticated equipment. Kaiser Aerospace, in the Stanford Industrial Park, manufactures pilot navigational displays for a large number of aircraft, including the A-6 and F-14. Data Dynamics in Mountain View reportedly produces stabilization equipment for secret reconnaissance satellites and Varian, in Palo Alto, makes a fire control system for F-4 "Phantom" jets.

COMMAND AND CONTROL: In this computer age, the Pentagon is the number one user of computers. To supplement its legendary system of multiplicate forms, the military uses computers to keep track of ships, fuel, men, lettuce, toilet paper, or whatever. It uses other machines to regulate the vast communications network it operates. Many of the computers and other control equipment come from large computer manufacturers such as IBM, which operates a major research facility in San Jose, but a Santa Clara company, Rolm, calls itself "Number 1 in MIL-SPEC (military specification) Computer Systems."

RESEARCH, TEST, AND SIMULATION: Military contractors at locations like Stanford, SRI and Lockheed use laboratory equipment to research a large number of technological questions of importance to the military. Small computing firms such as Systems Control in Palo Alto conduct analysis for military agencies. And Ames Research, a facility of the "civilian" National Aeronautics and Space Administration (NASA), houses the Pentagon's ILLIAC IV computer, the world's most powerful data processing system. ILLIAC, among its tasks, conducts simulation of wind tunnel activity, global climate modeling, and antisubmarine warfare research. In addition, Hewlett-Packard, located in several peninsula towns, contracts to provide the military with test equipment for a wide variety of electronics systems.

ELECTRONIC WARFARE: To counter enemy radar and other detection devices, U.S. ships, planes, and missiles employ a wide variety of jamming, deception, and other countermeasures, including missiles which home in on hostile radar emissions. Itek's Applied Technology Division in Sunnyvale and Textron's Dalmo-Victor operation in Belmont, are leading manufacturers of such "radar homing" equipment while GTE Sylvania produces two of the Navy's top electronic countermeasure systems. The Peninsula includes so many organizations involved in electronic warfare, a field which includes electronic intelligence,


MULTISENSOR DEVICES
GROUND RADAR, COMMUNICATIONS
MANPACK RECEIVERS & TRANSMITTERS

direction finding, and countermeasures, that two trade magazines devoted to the subject are produced in this area: *Electronic Warfare* and *Countermeasures*.

WEAPONRY: In the past decade electronic "death rays" have risen from comic books to a billion dollar Pentagon project. To solve the enormous technical problems of producing such weaponry, the Pentagon has contracted with a battery of aerospace firms, including local plants of Lockheed, Varian, and Mark Systems (Cupertino).

COMPONENTS AND OTHER OFF-THE-SHELF EQUIPMENT: Most of the companies mentioned above produce military systems. Many other local firms produce components for these systems. Ampex (Redwood City) sells magnetic tape "recorder-reproducers" to the Air Force, to be used for navigation or countermeasures on aircraft such as the B-52 and B-1. Varian, Watkins-Johnson, and Litton (San Carlos) sell electronic tubes to the military. Varian even has a publication, "Varian Products and Capabilities for Countermeasures." And while local laser manufacturers do not specialize in military production, the military still holds the biggest share of the laser market.

The Army, through the Minuteman missile system, spurred the development of solid-state components in the early 1960's, pouring hundreds of millions of dollars into the semiconductor industry at a very important time in its history. Today, the Peninsula's vast semiconductor industry not only provides components for computers and other equipment purchased by the military, but, of the 23 companies that qualify as producers of "military spec" integrated circuits, the peninsula has 11: Advanced Micro Devices, Fairchild, Intel, Interdesign, National, Nitron (McDonnell Douglas), Precision Monolithic, Raytheon, Signetics, Siliconix, and Zilog. Signetics, in fact, has a separate division for designing and producing military products, while Fairchild ships some of its components to Syosset, New York, where its Space and Defense Systems Division manufactures military electronics systems.

Spurred by the anti-war movement, particularly students at Stanford University, many local residents have questioned the County's heavy involvement in military technology. Not only have they challenged the uses of the weaponry — either their actual deployment in Indochina or the threat of their use in nuclear war — but they have pointed out the problems of building an economy so dependent on weapons funding.

A few people have quit the industry over such issues, but the majority of the workforce has avoided the criticism. Some, especially production workers at plants producing off-the-shelf equipment for the military, are unaware of the military applications of local production, while others — be they scientists or assemblers feel trapped economically. Others, of course, support U.S. military policy and are pleased to contribute, while yet another group sees specific electronic systems — such as satellite reconnaissance — as a force for peace. The satellites, they contend, permit monitoring of disarmament agreements.

But military research and production would continue here regardless of local sentiment. The men and corporations who run our country want high technology military products, for both economic and strategic considerations. This area, as it has developed since World War II, has little choice, unless drastic political change occurs here and in other parts of the country.

AUTOMATION

Many of the products of Santa Clara County industry are considered labor saving devices. From computerized bookkeeping systems to manufacturing control systems to automatic cash registers, they relieve people of drudgery or difficult tasks. But labor-saving is a two edged-sword. The same "point of sale" cash register/inventory systems that engineers at National Semiconductor find rewarding to design put clerks out of work wherever they are installed. Computers — either built locally or from local components — have supplanted bookkeepers in many institutions, replacing them with computer programmers. Frequently the computerized systems have created less rewarding tasks, requiring the services of unskilled white collar workers — who merely code data for computerized processing.

Computers have done more than make old jobs more efficient. The enormous capacity to process data has created new industries. It is easy to see how computers have made the complicated task of space travel workable, but data processing technology has enabled insurance and credit companies, government agencies, and utilities to keep up with their paperwork. Tymshare, Inc. of Cupertino not only operates a Medical Data System and a data communications network, but it recently took over computing for the Master Charge system. Master Charge is often a convenience, but as anyone who has tried to correct a billing error knows, it is hard to talk back to the computer.

Technological unemployment, increased specialization, and centralized "do not fold, spindle, or mutilate" systems are not the necessary result of advanced technology. Rather, as in the past, they accompany a specific form of industrial growth, in which the nature of technology is controlled by a small number of people in corporations or government.

Point of Sale Cash Register

Santa Clara County companies produce many "good" electronics products, with indisputable positive impact. They make machines to help the blind see, ultrasonic x-ray equipment, solar energy generators, pollution control devices, and birth control pills. Frequently, these devices are developed using technology originally funded by the military. Thus, scientists and engineers point to the "good" applications when they either defend military research or explain how different their work is from military production. In fact, a major thrust for diversification or conversion from military work comes from dissatisfied military technologists.

High technology corporations, like any other profit-making business, favor new product lines when they can make money on them. In general they do not look at society and develop products to meet social needs. Rather, they look at their proprietary technology and capabilities, and decide how to take advantage of the market situation. To the extent that government agencies, such as the federal medical system, fund new products, the companies respond to someone else's calculation of social need.

While medical electronics systems of course aid individual patients, the current process of development has a fundamental flaw. The companies, government agencies, and foundations that have dominated the field have utilized the most advanced technology available, rather than the most appropriate. Modern drugs and patient monitoring systems — many of which are produced here in Santa Clara County — have increased the cost of health care so significantly that the medicine available to many people has actually diminished in quality. Since the expensive cures do save lives, they are sacrosanct, but if society were to put the same resources into alternative technologies — especially preventive medicine — more lives could be saved, and good medical care would no longer be the privilege of a few.

In typical American fashion, technology is substituted for social and economic change. Local semiconductor firms are selling auto manufactures on the benefits of microprocessors, which for little cost will effect great energy savings. In itself, this is positive, but the real solutions to energy waste in America go much deeper, to de-emphasizing auto travel and making social, not individual or corporate decisions, on energy use.

Frequently, when a new product is associated with social and economic progress, it is touted as the cause of change. Technological achievement, however, is more the result of social change than its cause. Take the case of the birth control pill. Carl Djerassi, the Stanford chemist who synthesized the first oral contraceptive and went on to serve as an executive at Syntex and

Zoecon Corporations, has said about the pill, "Nothing has had a bigger impact on the emancipation of women and on the fostering and stimulation of women's rights." Djerassi conveniently forgets that contraceptive research, a process which took many people and laboratories decades, was pushed by women such as Margaret Sanger and Emma Goldman, precisely because they demanded liberation from the exclusive role as childbearer. The pill was developed for women, not men, because women faced the consequences of childbirth — both physically and raising a family — more directly than men. Only today, as society begins to consider child-rearing to be a male responsibility as well, are studies of male contraceptives making progress.

Computers, modern communications systems, medical electronics, and digital watches are visible symbols of Santa Clara County technology. To the workers in local plants, or the people laid off elsewhere as a result of the technology, they also represent aspirations. In this role, advanced technology has its greatest potential for social change. Should the corporations and government agencies that control modern technology not take steps to meet those aspirations, they are then threatened with social upheaval.

At this point, however, rebellion of any sort seems unlikely, but this is partially because the powers-that-be are applying modern technology to forestall upheaval. Computerized data banks and modern police communications systems aid government agencies in the suppression of protests that "get out of hand," and the sophisticated, centralized broadcast media system provides America's rulers with the power to mold, though not control, the thoughts of the citizenry.

The uses of the fantastic technology of Silicon Valley can improve life in this area, this country, or even worldwide, but they can also worsen or even destroy it. Its impact does not depend merely on the technology itself, but upon who controls it.

How it's Made

Most people are mystified by high technology industry and the issues that it raises, precisely because they are unfamiliar with the industry's advanced level of technology. Even many of the people who work in the factories and offices do not know how it all fits together. In the rapidly developing electronics industry, this is particularly true.

Industries which produce more traditional kinds of equipment, such as cars, trucks, or refrigerators, are easy to understand. Most of the work goes into actually fabricating parts and assembling them into familiar products. Relatively little human power is spent on research and development. In Santa Clara County's electronics industry this is not the case. Companies succeed only if they are able to conceive, design, and produce innovative products. Large amounts of funds are spent on research.

SMALL QUANTITIES

Government statistics show that Lockheed Missiles and Space Company, the county's largest employer, is the local manufacturer most dependent on research. Fully two thirds of its hundreds of millions of dollars in military contracts each year is categorized "research, development, test, and evaluation." But those figures are misleading. Rather than conducting university-style basic research, Lockheed builds prototype weapons systems. It employs a large number of scientists and engineers to produce small numbers of complex devices. Thus, Lockheed and other major systems manufacturers — such as Ford Aerospace — differ from other local high technology firms in that they do not carry out mass production.

MASS PRODUCTION

The production of smaller weapons systems, electronic equipment, and specialized electronic tubes at companies such as Itek, Hewlett-Packard, Varian, and Spectra-Physics, resembles the assembly lines of traditional equipment manufacture. Research and development, whether funded by the government or by the company, is generally independent of the production process. Hewlett-Packard has experimented with other methods of mass production, having single workers carry out several tasks, but this is the exception rather than the rule.

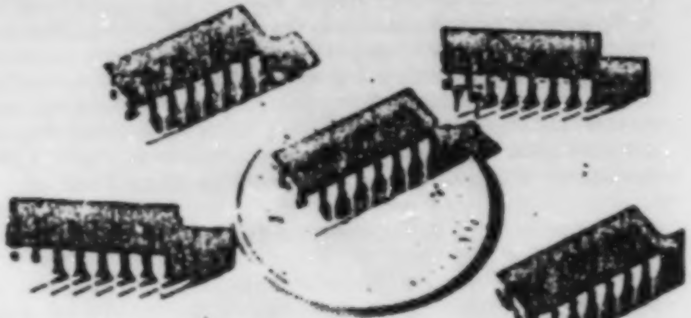
SEMICONDUCTORS

The semiconductor makers that build intergrated circuits — the essential components of solid-state electronics — have developed a system of mass production with a new wrinkle. Products are shipped overseas midway in the assembly line. Like the systems and equipment manufacturers, semiconductor firms center their research and development activity in Santa Clara County. Scientists and engineers in local labs and headquarters constantly come up with new products and new techniques for producing old ones.

Regardless of the function of an integrated circuit, production always begins with capital-intensive (requiring expensive equipment and little labor) *wafer fabrication*. Advanced Micro Devices president Jerry Sanders explains:

> This process consists of a series of chemical and physical processes in which photomasks are placed in contact with a thin slice of silicon called a "wafer" 2 or more inches in diameter. Additional chemical processing prepares the wafer for selected introduction of certain chemical impurities. These selective impurities impart to the silicon the properties necessary to form electronic components. Upon completion of the wafer fabrication, each wafer contains hundreds — or in some cases thousands — of identical monolithic circuits — "die" or "chips."

Most Silicon Valley companies carry out wafer fabrication locally, close to their management, engineers, and skilled personnel.



Plastic-Encapsulated Integrated Circuits

Once the wafers are fabricated, each of hundreds of circuits on each wafer must be tested individually, and those circuits which do not perform adequately are identified. Computerized test equipment, valued at $350,000 or more per tester, is required for this *wafer sort* process. This work is consequently also carried out in Santa Clara County plants.

Wafer circuits are useless unless wires are bonded to them. In the *assembly* process, the wafers are split into individual chips, and defective ones (already identified in wafer sort) are discarded. Wire leads thinner than a human hair, and sometimes only one tenth of an inch long, are bonded to the chips. These assemblies are then sealed in ceramic, metal, or plastic.

This microscopic work is highly repetitive, involving large amounts of manual labor. It requires little technology, equipment, or skill. Because it costs little to transport the lightweight circuits, even by air, all semiconductor companies conduct most of their labor in areas where labor is cheap. Although many companies carry out some assembly in Santa Clara County, where they can carefully watch the production process and test new methods, all also conduct assembly work in one or more Asian countries. (See the section on LABOR.)

Although a major portion of the semiconductors assembled in Asia are eventually marketed in Japan, Europe, and other lands, most companies ship their assembled circuits back to the U.S. for final testing. Like wafer sort, final testing requires both high technology and expensive equipment. Special provisions in the U.S. tariff code — which the industry defends with vigorous lobbying — allow companies to pay tariffs only on what they say is the value added by the foreign assembly. That is, they need not pay duties on the imported chips, just the costs of the wires and frames and the pay of the assemblers.

MARKETING

Only a small percentage of the electronics manufactured in Santa Clara County is marketed directly to the public — digital watches and calculators, for instance. The sophisticated communications equipment, electronic weaponry, measuring devices, lasers, computers, and components that dominate production require marketing personnel familiar with high technology. Thus, the engineers and sales force at both ends of the production sequence of high technology industry are well versed in the mechanisms and applications of the technology. On the other hand, production workers, as well as consumers and taxpayers, remain basically uninformed.

Workers in Asia

Impact on Labor

Satellites, computer memory disks, light emitting diodes, kidney dialysis machines . . . this list of ultra sophisticated products continuously grows in the annals of Santa Clara County electronics firms. This industry is proud of these technical achievements. However, in focusing on these technological breakthroughs, one can not forget the thousands of workers who have planned, blueprinted, and assembled these products.

Approximately 200,000, or one third of the work force, are directly or indirectly involved in the electronics industry in Santa Clara County. The State Employment Development Department (EDD) totals these figures from the hundreds of electronics companies, chemical manufacturers, computer programming services, employment agencies and other local businesses that are directly tied into the electronics industry.

120,000 people are employed in the 173 major electronics companies alone. This figure diverges from other EDD surveys that peg local electronics employment at approximately 85,000.

These electronics companies constitute a major industrial center. However, their elegant industrial parks camouflage the many serious problems that workers face on a day to day basis. These workers deal with some of the most dangerous health and safety conditions in the United States. Workers constantly face the threat of forced overtime or layoffs due to the rapid fluctuations in market demand. Large portions of the workforce are employed in low paying, low skill assembly line jobs. Workers are becoming increasingly divorced from the results of their labor as a result of increased automation and specialization. Workers suffer these and other problems in isolation, as they are virtually unorganized in the Santa Clara County area.

COMPOSITION

> "85% of the production workers are women and 50% of those are third world. They are promoted very slowly, although affirmative action is helping that now. An Hawaiian woman is supervisor. There is only one woman engineer in the whole place. And almost all of the electronics technicians are men. So its pretty blatant discrimination." — assembly line worker in a Santa Clara semiconductor firm.

Large portions of the electronics workforce are involved in direct production activities, despite the industry emphasis on research and development activities locally. Nearly 50% of the workers in the semiconductor branch are actually on the assem-

SEMICONDUCTOR INDUSTRY: SURVEY OF 5 PLANTS

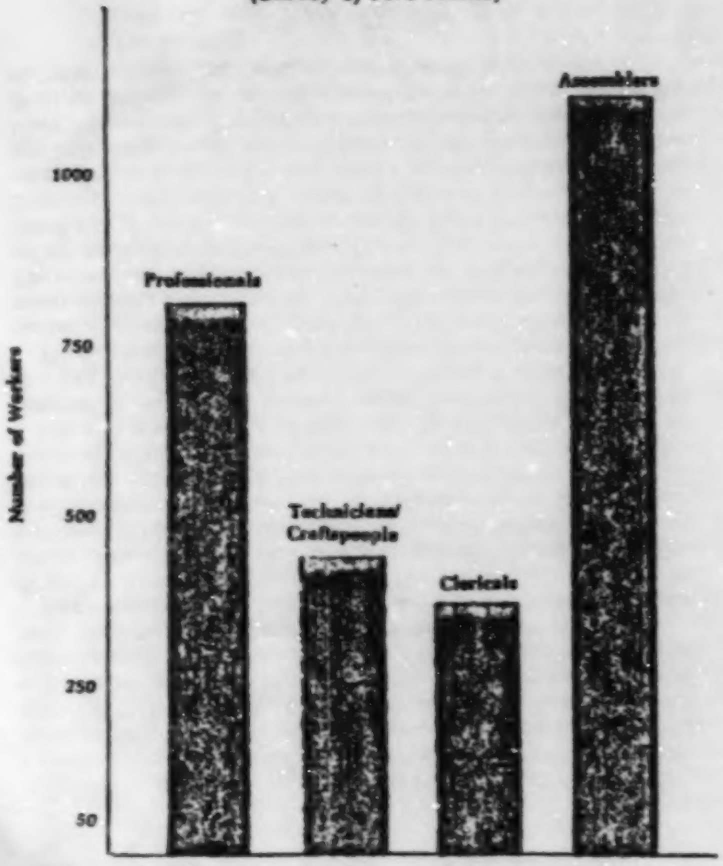
	Total	Professionals & Managers	Technicians & Craftspeople	Clericals	Assemblers
Total	2837	811	434	389	1106
Male	1282	786	327	67	52
Female	1555	25	107	322	1054
Minority Total	796	91	83	51	571
Male	168	82	58	12	16
Female	628	9	25	39	555
Black Total	89	5	10	5	69
Male	16	3	9	1	3
Female	73	2	1	4	66
Spanish Speaking Total	417	24	45	30	318
Male	70	21	28	8	13
Female	347	3	17	22	305
Asian Total	279	60	28	16	175
Male	80	56	21	3	0
Female	199	4	7	13	175
Am. Ind. Total	3	2	0	0	1
Male	2	2	0	0	0
Female	1	0	0	0	1

bly line. Five local semiconductor plants with a total workforce of 2837, employ 1106 assemblers and 434 technicians. Another survey of four electronics equipment manufacturers found 1039 assemblers and 701 technicians out of a total of 3369 employees.

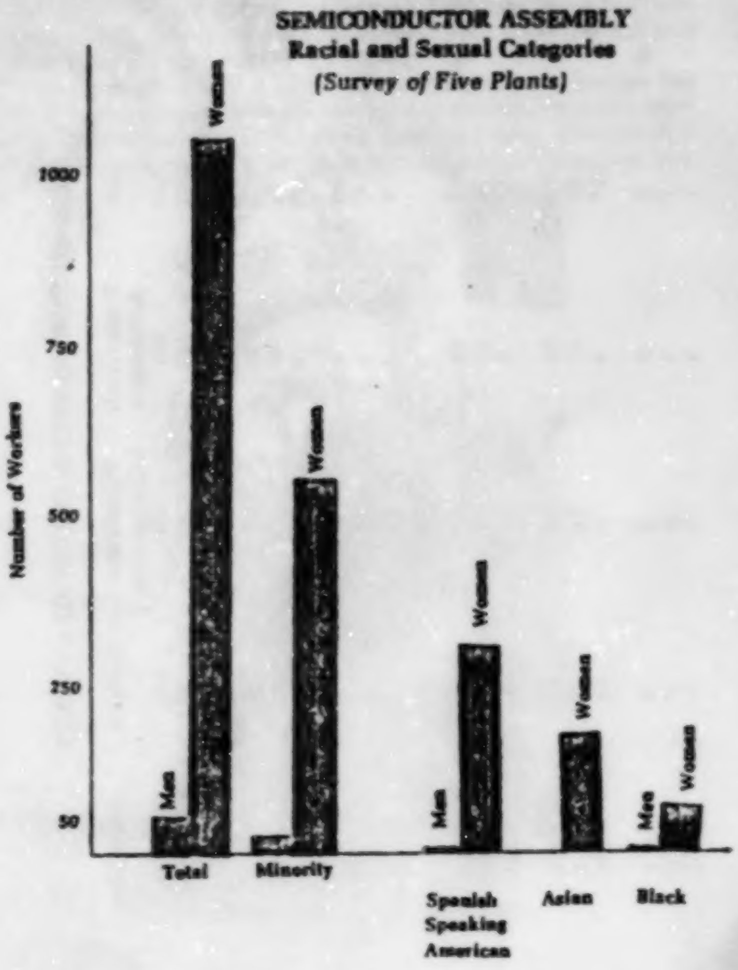
There are distinct patterns of racial and sexual discrimination in the electronics workforce. There are 704 white males out of a total of 811 professional and management staff in the five semiconductor plants. Men also predominate in the categories of technicians and craftsmen, 327 out of 434. Clericals consist mainly of women, 322 out of a total of 389, 84% (283) of these are white. The overwhelming majority of assemblers are women, 1054 out of 1106. Of these women, 54% (555) are minorities, mainly Spanish speaking and Filipino Americans.

Wages and salaries for these different categories vary dramatically. Starting wages for assemblers begin at the legal minimum wage of $2.50/hour. Technicians earn entry level wages of $3.50-$5.00/hour. Engineers start at salaries ranging from $12,000 to $35,000 a year.

SEMICONDUCTOR INDUSTRY
Occupations by Category
(Survey of Five Plants)



SEMICONDUCTOR ASSEMBLY
Racial and Sexual Categories
(Survey of Five Plants)



> "We work with acids, one woman was asked when she was hired if she knew anything about acids. She said 'no,' the supervisor said, 'Good then you won't be scared by them.' Also its crowded and things aren't organized. Just recently a bottle marked acetone was filled with waste acid, and a woman poured and it all started steaming and the vapors are very dangerous to breathe in and are caustic. We work with solvents too which are dangerous. I get headaches from all this as do other people." — an assembly line worker at Siliconix, Santa Clara

> "Since I've been at Lockheed, I've been laid off a total of 5 times in 9 years, for a total of 3 years. Layoffs are real severe problems, to people who are married, people who have house payments, families to bring up." — a machinist at Lockheed, Sunnyvale

These two workers have raised some of the many serious issues workers in the electronics industry have to face, dangerous health and safety conditions, constant cycles of hiring and firing, stressful and pressured jobs, unorganized work places.

Health and safety problems are immediate to every worker's life. The industrial and scientific instruments industry is the first most dangerous and the electrical instruments industry is third most dangerous for workers in terms of exposure to carcinogenic substances according to the National Institute of Occupational Safety and Health (NIOSH).

Electronics production work, particularly in the semiconductor industry, is a series of sophisticated chemical reactions. Workers use a number of solvents, acids, fiberglass materials and gases from the initial fabrication of a silicon "chip" through the final assembly and testing phases.

Workers complain of physical problems after using these chemicals, ranging from nausea, headaches, dizziness, skin rashes, respiratory problems to liver and kidney problems. Researchers are very concerned about the long term carcinogenic (cancer-causing) effects of these chemicals, particularly the possible connection between TCE and breast cancer. TCE has been proven to cause breast cancer in test animals. Other suspected carcinogens include benzene and chloroform.

The industry will not openly acknowledge that these health and safety hazards are a problem or even its responsibility to worry about. Workers have reported of harassment by management if they complain about the safety conditions. It is difficult for workers to prove that health problems are job related. There are federal and state regulatory agencies, the Occupational Safety and Health Administration(OSHA)and Cal OSHA which have regulations about many chemicals but are too bureaucratic and slow, according to workers. Also workers report becoming ill even when air levels of specific chemicals are within OSHA standards. At one California plant women complained of nausea and dizziness after using TCE in amounts one-half those of the OSHA maximum.

The relative infancy of the electronics industry and the constant innovation in production processes also contributes to dangerous health and safety conditions. Because of intense competition, companies develop new production techniques rather than research health and safety.

Companies bear the responsibility of providing the safest possible conditions and informing their workers about dangerous chemicals. According to workers, the companies are not fulfilling this responsibility. Several assemblers at a small semiconductor plant reported that despite the publicity about the dangers of TCE over the past several years, their employer has just installed vents in the past six months.

Workers must deal with other serious problems besides the dangerous chemicals. Workers often experience eye strain, after peering through a microscope for hours at a time. Workers also report of migraine headaches, ulcers, high blood pressure, and

Soldering can produce dangerous fumes which result in nausea, chest pains, or liver damage.

dependency on amphetamines, because of the intense pressure to increase production. Since companies have not fulfilled their responsibility, pressure by organized workers is needed to force the companies to provide optimal health and safety conditions — adequate ventilation, protective clothing, decreased production pressures, and worker controlled health and safety committees.

ORGANIZATION

One of the paradoxes of the local electronics industry is that despite the poor working conditions, very few companies have union organizations. Those companies that have unions are generally the established large systems firms such as Lockheed and Westinghouse rather than the newer semiconductor companies. Since the local electronics industry is generally an open shop, workers are inexperienced with the potential benefits of unionizing. Company attempts to put down any unionizing efforts and their threats to move production overseas also hinder union organizing.

The electronics industry has built up its presence in Santa Clara County, after shifting from the highly unionized areas of the East Coast. It has found the unorganized workforce of Santa Clara County to suit its needs.

Statistics show that the production workforce in the local industry is primarily minority and women. Many of these women come from farm labor backgrounds and consider these factory jobs to be a step up. Many workers are recent immigrants from Asia and Latin America and can only find assembly jobs. The majority of these workers who are women are particularly vulnerable as many are raising families alone.

The transiency of assembly line work also prevents unionizing efforts from developing. The frequent fluctuations in production levels mean that workers are constantly being hired and laid off. Companies often have a policy of maintaining a temporary workforce on the assembly line to avoid paying the legally required fringe benefits. Companies reportedly use the excuse of decreased production levels as a means of laying off workers suspected of being active in organizing attempts.

The Western Electronics Manufacturers Association (WEMA) provides companies with many resources to fight any unionizing attempts. WEMA maintains close surveillance on any union campaigns. It also provides seminars for executives on how to keep unions out of the plants. Recently, at one such seminar, executives simulated a unionizing drive in order to better understand and control potential union drives in their plants.

INTERNATIONALIZATION

The electronics industry creates a tangible bond between Santa Clara County and many other countries, particularly those of Asia and Latin America. While the industry is primarily headquartered in Santa Clara County, it literally spans the globe with production, warehousing, administrative and sales facilities. Lester Hogan, Vice-Chairman of the Board of Directors of Fairchild Camera and Instrument Co. of Mountain View, explained. "Because of this international structuring, the U.S. semiconductor industry has been able to compete, and in fact dominate world markets."

The history of this internationalization process has been a quest for ever cheaper production costs. In this technically competitive industry, the main means of cutting production costs has been to cut labor costs. Companies have gone overseas in order to pay wages a fraction of those in the U.S. These corporations have paid wages in Asia ranging from $90.00 (U.S.) a month in Taiwan, to $43.20 in Malaysia, to approximately $30.00 a month in Indonesia for assembly work.

Fairchild serves as an example of this international frontier breaking. It currently operates facilities in at least 18 countries, at least 10 of which have production facilities. Fairchild was the first U.S. electronics corporation to begin assembly operations in Asia, when it set up a factory in Hong Kong in 1963. It followed this with a plant in Korea in 1965/66, in Singapore in 1968, in Indonesia in 1973/74. When Fairchild set up its Hong Kong plant it was primarily interested in setting up a system in which "the advanced countries would concentrate on the high-technology work and managing and the poor countries would mainly do the manual work," according to Hogan. Fairchild has recently moved a major warehousing facility to Singapore in order to have greater access to markets in Asia and Europe.

Asian governments have invited these corporations in with the hopes of gaining technological expertise, increasing foreign exchange and soaking up some of the large pool of Asian unemployed. However, these societies have received negligible benefits if any, from these corporations. First, the corporations bring only the lowest level technology to Asia, that of the assembly and warehousing operations. These corporations have a strict policy of retaining research and development in their U.S. installations; to keep the research closely synchronized with top level policy decisions and to protect the vital technology from competitors.

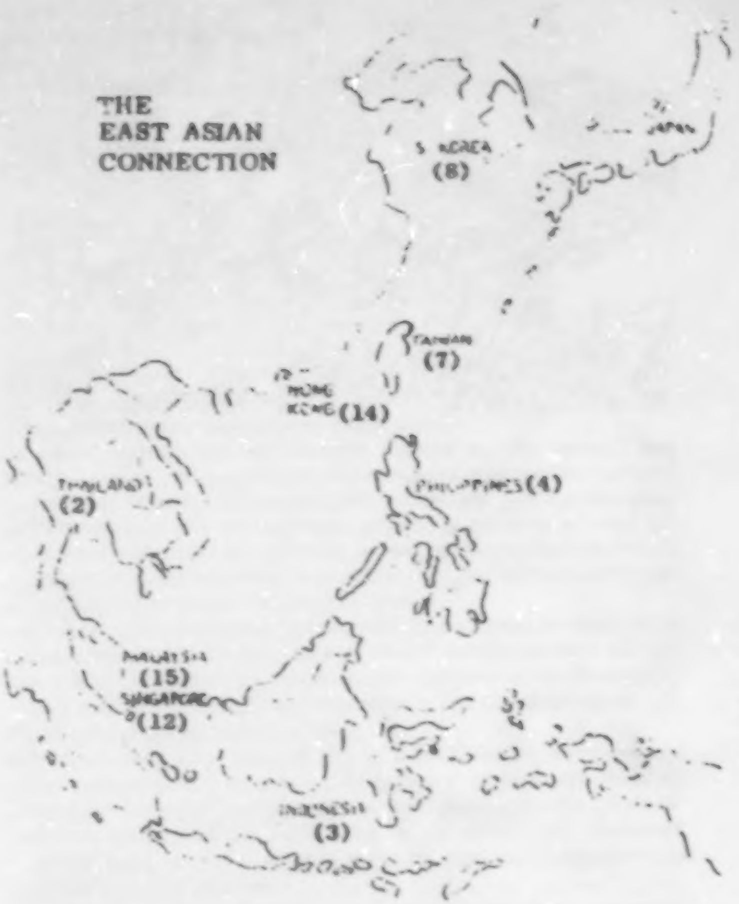
The electronics firms only make a minor contribution because they do not integrate their activities into the Asian economies. They bring the components to Asia and then re-export them immediately to the U.S. for final testing.

Finally, these companies do not alleviate the terrible unemployment problems in the Asian societies. They offer only the lowest paying, low skill jobs and retrench workers as frequently as in the California plants. Fairchild in Singapore, for example, fired almost half of its 3600 employees in response to a recession in the semiconductor market in 1974 and 1975.

These companies also bring dubious benefits from the point of view of an Asian assembly line worker. These workers are almost exclusively women between the ages of 16 and 25. Many of these workers support their families with these incomes. In Korea, young women are required to have nearly perfect vision to get an assembly job. However, within the first year of employment, 87.5% have severe eye problems including chronic conjuctivitis, near sightedness, and astigmatism, according to one study.

These Korean workers receive inadequate wages. Workers at Signetics earn $98.00 (U.S.) a month despite the Korean government's statistics that a family of five needs at least $200 a month minimum income, causing great hardship for women financially responsible for their families.

These workers are thrust into alien cultural and social settings with these jobs in foreign owned factories. They are often required to live in factory dormitories, cut off from their communities. In Penang, Malaysia, the electronics companies sell cosmetics, provide beauty classes, play continuous rock music in the factories. They even sponsor "Miss Intel" or "Miss National Semiconductor" beauty contests. These young Malay workers are so barraged with media that they respond with attempts to assimilate the Western ideals of beauty — they often spend a substantial part of their already meager salaries of 50 cents a day on cosmetics and other products in the hopes of



THE
EAST ASIAN
CONNECTION

Assembly Plants With Parent Companies
In Santa Clara County

SIGNETICS KOREA CO.LTD

appearing like the women pictured in the advertising. Tragically, these young Malay women are then sometimes branded as "loose women" by their conservative communities.

Government labor policies in these Asian countries are very attentive to the needs of the employers. Most of these governments prohibit or severely regulate labor unions, and ban strikes. The South Korean government enacted laws purportedly to eliminate lengthy labor disputes. In practice, the government steps in to "solve" any labor disputes with police troops. Korean workers have no right to organize, to bargain collectively, to strike. Knowing that striking was illegal, Korean workers at Signetics staged a five-day hunger strike and sit-in demonstration in the company cafeteria to gain higher wages. They won an increase from U.S. $80.00 to $98.00 a month. Despite two repressive government policies, these workers found that organized action was successful.

The situation of the Korean workers points out the common problems Asian and American labor face. Essentially, they are on different sections of the same assembly line. Workers experience the same dangerous health and safety conditions, the same repression of unionizing attempts, the same inadequate wages, and the same lack of control.

The companies and established labor unions in the U.S. have undermined this potential unity. The unions have launched a "buy American" campaign and are urging Congress to restrict imports of foreign assembled products. They have blamed Asian, Latin American, and other workers for the job cut-backs and other problems American labor is facing.

But these transnational electronics corporations make the decisions to move to Asia, to Latin America. These corporations rather than foreign workers bear the responsibility for cutbacks in American jobs.

This high technology owes much to the thousands of workers who labor here and abroad. However, it has consistently ignored the welfare and needs of these workers. Conditions will not improve until these assemblers, technicians, and engineers organize to form health and safety committees, unions and communication links with co-workers in other countries.

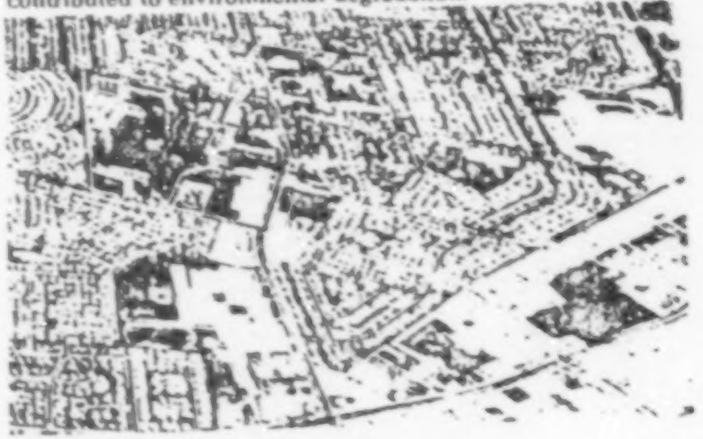
Land Use Crisis

Residents of Santa Clara County, while blessed with a naturally beautiful environment and a prosperous economy, face many problems in their search for the good life. All but the very rich are aware that finding a decent place that you can also afford is a difficult task these days. Costs are astronomical and still rising, and there are few vacant housing units to be found. The high price of housing means less money to spend on food, clothing and health care.

Those lucky enough to find housing (not everyone does — there are 50,000 people who work in the county but commute from other areas) are likely to face a long daily commute to work. Since public transportation is inadequate, commuters have an expensive and time wasting trip along congested highways to get to and from work every day.

Not only are housing and transportation problem areas, but the once beautiful climate of the region is increasingly threatened by the pallid layer of smog which hangs over the valley. Next to Livermore, Santa Clara County has the worst level of air pollution in the entire Bay Area.

Housing, transportation, environment. Too often these problems seem separate and distinct. In fact, however, the origins of these problems are inextricably linked to the growth and development of local high technology industries. The private decisions made by the electronics industry have affected the housing problem, shaped the commuting pattern of the county, and contributed to environmental degradation.



HOUSING: WORKERS WITH NO PLACE TO LIVE

Housing in Santa Clara County is rapidly approaching a crisis situation. The average wage earner cannot afford the lowest priced new single family home even in South County, not to mention a house in the higher priced Palo Alto area. Many families spend too much of their income on housing. Many of the available units are in need of heavy repairs and are overcrowded. Most housing is located too far from centers of employment. And finally, many people still face blatant and illegal discrimination in their search for a place to live.

Several reasons are often given for the lack of affordable housing: prohibitive building costs, the high price of land, soaring interest rates. While each of these explanations is true, there are more fundamental reasons behind the housing crisis. The electronics industry expanded rapidly, first in Palo Alto, and then south to Sunnyvale and Santa Clara. Firms concentrated in the northwest part of the county to be near Stanford University, so managers and engineers could live more conveniently in Palo Alto, Atherton, or Woodside, and to be near suppliers and customers. Industry growth, however, from the Stanford Industrial Park in the 1950's to the latest Santa Clara site, was and is planned with no concern for where the majority of employees would be able to live.

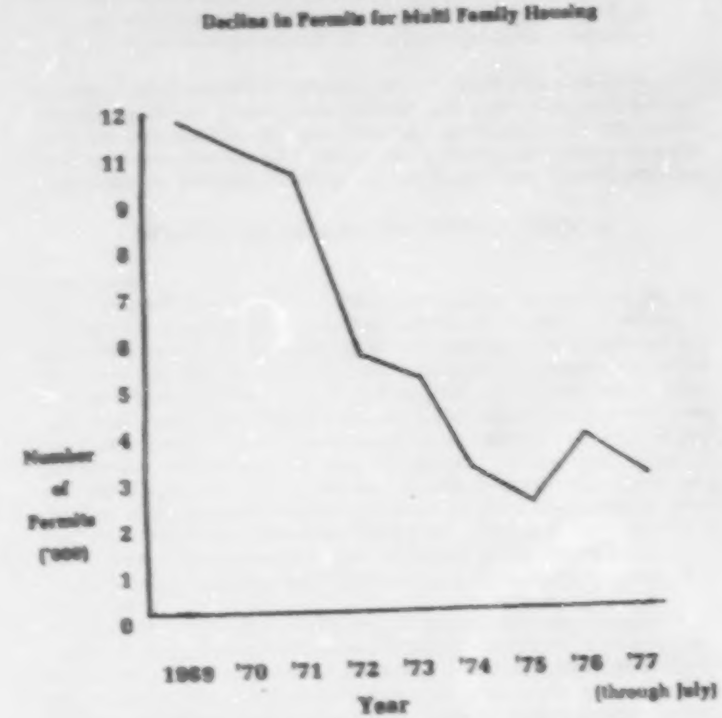
Cities encouraged industrial expansion by offering land and financial incentives, often changing land zoned for housing to industrial use. Robert Mang, head of the Santa Clara County Housing Task Force, explained

> Palo Alto showed the rest of the county in the late 1950's that it was more beneficial to have a clean industry base which yields a net gain in revenues than to have a lot of single family homes which, below a certain assessed valuation, use more services than they yield in taxes. So Mountain View, Sunnyvale, Santa Clara, Cupertino, and San Jose picked up on this and where many of them used to be the bedroom communities that served Palo Alto's jobs, they've now become the competitors for industry and also not balanced their industrial expansion with sufficient housing.

In other words, encourage industry to locate in your town, but don't worry about housing the employees of those firms since that isn't profitable. The costs of this imbalance are borne by middle and lower income people forced to live elsewhere.

Cities rezoned residential land for industrial use. Between 1965 and 1975, the total number of housing units that could be accommodated by cities zoning plans fell from 978,000 to 561,000, a decrease of 417,000 housing units. In addition, fewer multi-family dwellings are being built. The number of permits issued for construction of buildings housing more than one family has fallen off drastically since the 1960's.

The recent upsurge does not reflect an increase in the number of rental apartments, but rather the new-found profitability of condominiums, which cater to more affluent residents.


Decline in Permits for Multi Family Housing

Source: Santa Clara County Planning Dept.

The worsening housing crunch is also seen in the very low vacancy rates. In 1971, the county as a whole had a rate of 13.1%. In 1976, this figure was down to 3.1%. In Palo Alto, rental housing has become so scarce that the vacancy rate has plummeted to .4%. These steadily falling rates are now "as low as you can ever expect to get," according to Dirk Wasserman, director of the Institute for Business and Economic Research at San Jose State School of Business.

While every city has been trying to attract industry and discourage residents, some have been more successful than others. Palo Alto, for example, had 70,000 people employed in the city in 1976. Only 11,000 of these live in Palo Alto itself. The other 59,000 live outside the city, mostly to the south.

1970 Palo Alto
Inflow and Outflow of Workers

Location	Homes of Persons Employed in Palo Alto	Work Places of Palo Alto Residents
Palo Alto	10,325	10,325
Stanford University (unincorporated portion)	500	1,479
Mountain View	5,804	1,042
Sunnyvale	4,675	1,059
Santa Clara	2,071	336
San Jose	5,310	665
Remainder S.C. Co.	9,400	1,256
San Mateo County	9,750	3,762
San Francisco	578	1,335
Alameda County	1,258	277
Elsewhere	608	1,886

Sources: 1) 1970 Census of Population, Journey to Work
2) Final Report, Palo Alto Menlo Park Area Transportation Project

While Palo Alto is the most extreme in this imbalance, other North County cities have similar patterns of employment immigration. In turn, communities in the San Jose area have been given the burden of housing these workers and providing them with education and other services.

Housing problems are not, however, simply the fault of the local cities planning and zoning strategies. The problem is more fundamentally the result of expansion of the high technology electronics industries. The rapid population growth of the past two decades was based on the increased availability of jobs in these industries. High technology firms gained a labor force which was utilized for corporate growth and guaranteed profitable investment. As is fundamental in the private enterprise system, the profits of these industries are privately appropriated by those who own them. The social problems which industrial expansion causes, however, belong to the public.

THE HIGH PRICE OF HOUSING

The net effect of corporate expansion and city government policy has been to restrict the number of housing units and drive up the cost beyond the means of most people who live and work in Santa Clara County. Local residents, particularly lower and middle income people, are finding that housing costs are rising much faster than their earnings.

While the cost of buying a single family home has risen severely in the country as a whole, local costs have gone up faster than the national average. Between 1970 and 1975, the average home price rose 68% nationally, but 92% in Santa Clara County. In the past year alone, average home prices in the county rose from $52,500 to $73,500, an increase of 40%.

Santa Clara is by all standards a well-to-do county, having the highest per capita income of any California county. Despite this affluence, earnings are by far outpaced by housing cost increases. Between 1970 and 1976, median family income rose 42.5%, compared to an increase of over 150% in the median value of a new home.

Urban planners and economists estimate that a household should spend approximately 25% of its monthly income on housing. Using this figure, fewer than 10% of Santa Clara County residents could afford the price of a new home. Fewer still could afford to live in areas like Palo Alto or Los Altos, where new homes average over $78,000 and $88,000, respectively. In addition, the price increases have tended to be steepest on lower price homes, accentuating the impact on lower income residents.

For people who rent, the situation is easier in terms of cost, but more severe because of the low availability of rental units. The cost of renting has also risen faster than income, but only by a few per cent. Residents with children have an even harder time finding a place to rent. A recent survey in Mountain View and Sunnyvale found that of 156 apartment complexes, only 37 accepted children. We noted earlier that permits for multi dwelling units have fallen off dramatically since the 1960's, and that vacancy rates were very low. In addition, many apartment complexes are being converted to condominiums, further reducing the rental supply. If condominium owners do happen to rent, the rental cost will be substantially higher to cover two layers of profit taking, one for the original developer, the second for the new owner.

IMPACT ON LOWER INCOME RESIDENTS

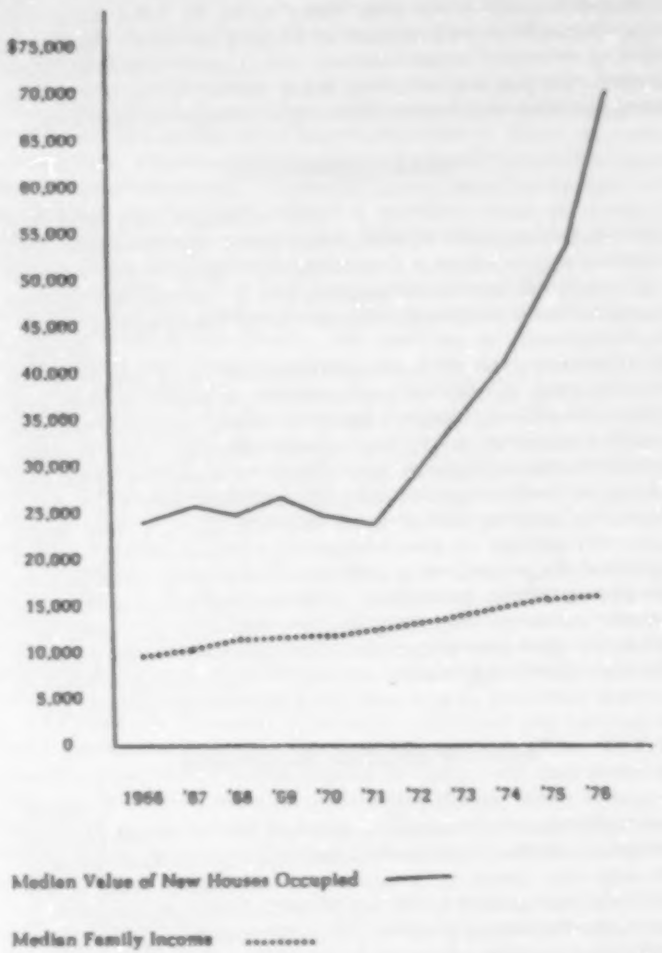
Economic hardships such as inflation and unemployment impose a burden on all people, but those of moderate and low income are always hit the hardest. According to the recent county Housing Task Force Report, the high cost and low availability of housing in Santa Clara County has meant that

> a low income household, in order to afford any housing at all, must live in a small, crowded unit, spending an inordinate proportion of its income for inadequate shelter.

The Santa Clara County Planning Department describes 168,340 households as low income, meaning that they earn less than 80% of the median county income. Let us consider the

Median Household Income and

Median Value of New Houses Occupied in Santa Clara County



Source: Harrington Housing Research Co.,
Santa Clara County Planning Department

situation in practical terms for the highest of low income families. Gross income would be approximately $1200 per month, with take home pay about $800. Deducting 25% for rent leaves the family with $497 for other expenses. The United States Bureau of Labor Statistics estimates that a middle income family needs $671.39 a month for food, transportation, clothing, and medical expenses. At this rate, the household winds up short $174.39 every month for what it needs to live decently.

This example is for the best off of the low income households, and assumes only 25% for rent. For the tens of thousands of families in Santa Clara County who earn less and pay more for rent, the economic pressures are more intense. Poorer families are forced to spend less on obtaining decent health care or buying enough food to eat.

Based on current city plans, only a small percentage of low income families who need housing assistance are slated to receive help in the near future. The chart below shows the portion of households who will receive some form of government assistance between 1977 and 1980.

	Palo Alto	Mountain View	Santa Clara	Sunnyvale	San Jose
Families	8.4%	23.2%	4.2%	18.5%	13.0%
Elderly	11.0%	44.4%	13.6%	24.5%	13.1%

Families form 81% of the households requiring housing assistance, elderly, the other 19%. The elderly in Mountain View are the only group which can expect to receive significant help. For others, particularly families in Santa Clara, San Jose and Palo Alto, no relief is in sight.

Two factors exacerbate the problems faced by low income families. The first is the practice of "redlining," where banks and other lending institutions restrict loans to certain areas, which, on the basis of low income and non-white population, are deemed poor credit risks. This practice makes mortgages and home improvement loans difficult to obtain. Therefore redlining contributes to the deterioration of existing housing and constricts the building of new units. It is too soon to judge whether the recent enacted laws against redlining will be effectively enforced.

Discrimination is the other factor which prevents people from securing decent housing. Despite the Fair Housing Act which prohibits discrimination by landlords on the basis of race, sex, or ethnic background, local studies indicate that illegal racial discrimination for housing is widespread on the peninsula. While this affects people of all classes, lower income people are most likely to suffer from this practice.

Mid-Peninsula Citizens for Fair Housing estimates that 40-60% of the rental units in North County are under management practicing some form of racial discrimination against blacks. The San Jose Human Relations Commission surveyed local housing and found that 31% of apartment complexes discriminate against Chicanos, while 27% discriminated against blacks. Similarly, a recent polling by the San Jose Mercury confirmed this pattern of discrimination, but pointed out that discrimination was more widespread in North County cities.

Minorities, particularly Filipinos and Hispanics, form a disproportionately large share of the lower paid production workers in local electronics industries. It is ironic that this same group of people who, because of economic inequality and racial discrimination cannot live near their jobs and are forced to move south.

PROSPECTS FOR THE FUTURE

All indications are that the trends of new jobs unmatched by housing will intensify in the near future. The continuing high demand for housing will keep prices high and availability low. The Santa Clara County Housing Task Force Report examined the general plans of local cities which zone industrial and residential areas. The report found that if land is built up according to plan, the number of jobs will increase by 500,000 (up 100%) while only 170,000 housing units would be built (up 43%). Continuing past trends, North County cities, where industry is currently concentrated, plan to add 64,000 jobs but only 7,000 housing units. Planners predict that 75% of population growth will occur in San Jose or in South County. However, even San Jose land is zoned to accommodate more jobs than housing, meaning that new "bedroom communities" will have to be developed.

More than 50,000 county workers now commute to work from outside the county. If employment grows as predicted, it is possible that by 1990, 325,000 county workers will be unable to find housing inside Santa Clara County, regardless of the price they would be willing to pay.

TRANSPORTATION

The patterns outlined in the previous section, where industry expands in North County faster than housing in South County, form the core of Santa Clara's transportation problems. Because many employees can't afford or can't find housing in Palo Alto, Mountain View, or Santa Clara, they commute to work daily from Central or South County. Anyone who has ever driven on the Central Expressway or the Bayshore Freeway is familiar with the daily traffic jams along these congested routes. The worst jam-ups take place, of course, heading north in the morning, and south after work in the late afternoon.

"The private automobile dominates our daily lives in Santa Clara County" states the Planning Department. Statistics confirm this statement. In 1976, there were more than 680,000 cars registered in the county, nearly one third of all cars in the Bay Area. Ninety per cent of local residents arrive at work by car, and the Transportation Agency estimates that commuting to work constitutes 35% to 40% of all county travel. By 1990, expected development trends will bring this figure over 50%.

In particular areas, these patterns of heavy job-related auto use are even more severe. In 1970 in Palo Alto, for example, more than 50% of all vehicle trips were work related. Since employment has grown since then by about a fifth and population remained constant, the percentage of work trips has increased.

The commute to work averages about 15 miles a day, which gets to be expensive when considered over a period of months or years. The costs of automobile use, in terms of purchase price, gas, insurance, etc., are also going up each year. Like the housing situation, transportation costs function as a regressive tax. Middle and lower income people, those least able to afford extra expenses, live farthest away from the employment centers and therefore are forced to spend more on commuting. For those commuting greater distances from San Mateo or Alameda County, costs are likely to be even higher. In addition, since new housing will be located in South County, the Planning Department estimates that the average commute will go up to 22 miles in the next few years, an increase of almost 50%.

It is more convenient and profitable for industry to locate in the north. While well-paid managers and engineers can generally afford the higher priced North County housing, the social costs are borne by the lower paid employees of the local electronics industry, among others.

If the pattern of heavy population growth and expanded employment is allowed to continue, it is likely that the existing transportation system will be totally inadequate to handle the increased traffic flows. The county Planning Department studied the prospects for increased roadway construction and concluded, "It presently appears that state and federal transportation funds will become increasingly more difficult to obtain for freeway construction as funding priorities shift toward public transit systems."

New road construction is not necessarily a sensible way to solve transportation problems, and several local and regional studies are evaluating mass transit alternatives. However, some alternatives, which are being proposed, entirely ignore the housing and jobs imbalance. The recent Santa Clara County light rail evaluation study (light rail is a modern streetcar system) suggested a light rail network that didn't even come close to Palo Alto, a major employment center.

Other studies, such as the joint Association of Bay Area Governments and the Metropolitan Transportation Commission's Corridor Evaluation Study, are seeking to accommodate employment and housing patterns. As well as examining light rail and expanded bus service, the ABAG-MTC committee is studying two land use development alternatives. The first is the "build out" of land according to existing general plans described previously. The second is the "reduced commute" alternative, which allows expanded jobs and population, but proposes that new employment and housing be located closer to one another to shorten the trip to work.

This means more industry moving to San Jose, while building more housing in North County. Increasing social control of business, while desirable, would meet with some resistence. North County cities, protective of their comfortable, low density housing and lucrative industrial tax base, will probably object to changing their development plans.

The problem, however, is not only a political one relating to local governments. Power based on economic position, in this case the powerful local electronics industry, will also stand in the way of making sensible planning policies. Since industry has found good reasons to locate in the north it will take concerted public power to challenge industry's prerogative to make socially harmful decisions.

In the current debate over transit alternatives, the Palo Alto Comprehensive Plan suggested that a tax be levied on industries based on the number of their employees who drive to work. The result would be to provide funds to finance transit, and to encourage alternatives to single occupant commute trips. There are problems with such a tax, notably how to prevent the costs to the employer being borne by workers receiving lower salaries or customers paying higher prices. Nevertheless, the realization that business should help bear the costs of problems which it helped create should be incorporated into any transit planning project.

ENVIRONMENT

Long time residents of Santa Clara County have seen the valley transformed from a peaceful expanse of farmlands and orchards to a center of high technology electronics and military industries. The San Jose to Mountain View area is one of the prime examples of the land use phenomenon labeled "urban sprawl." Low density economic development has blotted out the natural beauty of the land. Industrial parks, freeways and housing tracts have covered the once fertile land with asphalt and concrete. Population growth and industrial development have caused the visible deterioration of our land, water, air and other natural and human resources. If future development proceeds as currently planned, these problems will intensify and become more difficult to solve.

Among the most visible and harmful of these environmental problems is the deteriorating quality of the air in Santa Clara County. Except Livermore, the county has the worst air pollution problems in the entire Bay Area, even worse than the heavily industrialized East Bay.

Part of this is due to the prevailing wind patterns which blow pollutants from other parts of the Bay Area. These substances subsequently become trapped in the valley. Local sources, however, particularly automobile emissions, contribute substantially more to pollution problems. Every day, cars in this area release 850 tons of the poisonous gas carbon monoxide into the air, as well as 240 tons of organic gases, an ingredient of smog. Both of these amounts are the highest recorded in the Bay Area.

The worst air pollution is around the San Jose area and extends north to Sunnyvale. This is the heart of the commute route from Central County homes to North County jobs. While the electronics companies generally think of themselves as a "clean industry," with no smokestacks bellowing harmful gases, the location of industry which forces daily commuting is directly responsible for the declining air quality.

The pallid layer of smog which hangs over the valley is not only an eyesore, it is also a significant health hazard. In 1976, the Federal standard for carbon monoxide levels in the air was exceeded on 61 days, while the oxidant standard was exceeded on 32 days. These pollutants, which come from automobile exhaust, cause, among other disorders, respiratory and nervous system problems.

The center of the worst pollution has shifted in the past decade from Livermore to eastern Santa Clara County and local pollution problems are expected to last long term. Regional pollution control experts estimate that the situation will improve somewhat in the next few years due to emissions control requirements, but after that air pollution problems will intensify. This is due to the expected increases in population and vehicle use. For example, according to a recent study by the Association of Bay Area Governments, carbon monoxide levels are expected to decrease about 10% by 1985, but by 2000 "a substantial increase in CO levels beyond those experienced in 1975 will occur." The same is true of the smog-causing organic gases which also result from auto emissions.

There is a more direct environmental threat from local high technology industries. These firms, particularly semiconductor manufacturers, use large quantities of toxic and corrosive chemicals as part of their production process. These chemicals must be neutralized before being discharged by sewage treatment plants into the Bay or being reclaimed for irrigation and other outdoor uses.

Industrial chemicals are not only harmful once they leave the factory. Inside the plant, workers are daily exposed to an array of dangerous organic solvents. These chemicals cause nausea and dizziness, as well as more severe liver and kidney problems, and possibly cancer. Little has been done to improve the environment for workers who must handle chemicals on the job. (See chapter on Labor.)

The final area of environmental impact of high technology firms is their heavy use of water even in time of drought. Local industry uses from one quarter to one third of the water supplied to the cities in which they are located. Most municipalities, with the exception of Palo Alto, actually encourage heavy water consumption by charging less the more you use. Homeowners are thereby charged higher rates than industrial users, who use more. For example, Fairchild Camera and Instrument Corporation has been known to use as much as 20% of the water supplied to Mountain View in a single month. In Sunnyvale, there are more than 60 corporations each using more than 50,000 gallons of water a day.

While some plants have been taking measures to conserve water, as have individual residents, the impact of heavy water use by the local electronics industry needs to be further explored and assessed.

Palo Alto recently revised its water rates so that large users are charged more. Other cities could encourage industry conservation by enacting similar measures. In addition, a small Sunnyvale semiconductor manufacturer recently installed a water recycling system to reduce the 120,000 gallon per day water use. While this process is expensive, at least from the corporate viewpoint, perhaps other local manufacturers should be required to do the same.

Taxes and Services

Santa Clara County's high technology industry generates valuable property tax revenue for the county, local cities, school districts, and other public agencies. Most local cities promote industrial development, to take advantage of the revenue, since the corporations require few direct services in exchange. However, the companies have found it profitable to concentrate in north county areas where engineers and managers live. Lower-income employees must commute from areas with proportionately less industry. They help earn the money that their employers pay to north county taxing agencies, but they and their families need public services in the San Jose area. Since industry provides relatively little tax revenue in San Jose, governments in that area have a particularly difficult time paying for those services.

San Jose, of course, has been aware of the problem for some time, and this year the state Office of Planning and Research discussed it in its draft "Urban Development Strategy for California."

> Palo Alto has been very successful in attracting high-quality industrial development, and equally successful in protecting its quiet, older neighborhoods from the intrusion of apartments. Therefore, the great majority of those who work in Palo Alto must commute from other towns located in Santa Clara County to the south. Palo Alto reaps the benefits of the high tax value of its industrial development, while other cities bear the high tax cost of schools, welfare, police, fire and other expensive services.

In fact, the problem crosses county lines. Workers commute to the Palo Alto area from Alameda and San Mateo counties as well.

HOW LOCAL GOVERNMENT IS FINANCED

In California, cities are generally responsible for providing public safety (police and fire) services, land use planning (zoning, permits, etc.), local parks and recreation, local public works (such as streets, sewage systems), and libraries. Some cities provide much more, from health care to gas and electricity. The funds to provide these services, as well as investment in public works and public buildings, come from a variety of sources: a percentage of state-collected taxes, particularly the sales tax; grants from the state and federal governments; "profits" on city-owned enterprises such as utilities; permit fees; and the

PROPERTY TAX AS A PERCENTAGE OF CITY REVENUES, 1975-76

Campbell	21.4
Cupertino	10.7
Gilroy	12.8
Los Altos	25.7
Los Altos Hills	20.6
Los Gatos	26.7
Milpitas	29.8
Monte Sereno	8.0
Morgan Hill	22.4
Mountain View	20.4
Palo Alto	13.4
San Jose	21.5
Santa Clara	15.4
Saratoga	14.8
Sunnyvale	23.2

The property tax is only one source of city revenue. Its importance varies from city to city.

property tax.

Property taxes supply Santa Clara County cities with anywhere between 10% and 30% of their revenues. Since certain other fund sources — federal money, permit fees, etc. — are tied to particular programs, the property taxes are even more important in financing the general operations of cities.

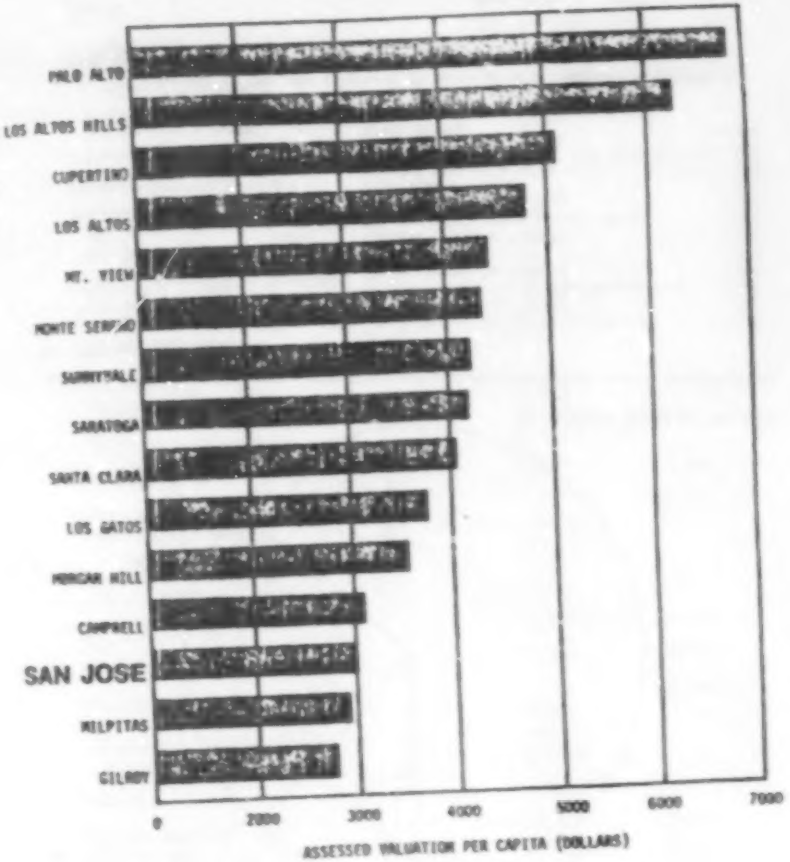
Schools, which actually spend more money than the cities they serve, are more dependent upon the property tax. Their only other major sources of funds are state and federal assistance. In Santa Clara County there are a mixture of districts. Some areas, such as Mountain View, Cupertino, and parts of San Jose have elementary school districts (including junior high schools) separate from high schools, while Palo Alto, Santa Clara, and a large chunk of San Jose have "unified" school districts, including both elementary and secondary schools. In addition, there are several community college districts within the county, combining the areas of high school and unified districts.

Property taxes also provide a substantial portion of funds to the county government and special districts. Some special districts, such as the Midpeninsula Open Space District, rely on property taxes for their entire budget, while others, such as water or hospital districts, also earn income by providing goods or services.

Each agency has its own tax rate. The amount of taxes a property owner pays is based on the sum of the tax rate for all the districts, including the city and county, in which the property sits.

All property taxes are collected through the county assessors office. The assessor, who is an elected official, manages a staff of property appraisers who periodically assess the market value of

1975-76
PER CAPITA ASSESSED VALUATION
Santa Clara County Cities



land, homes, businesses, and their contents. The *assessed value* which they assign is supposed to be 25% of the market value of the property. Once a year the assessor mails all property owners in the county a tax bill, which equals the *combined tax rate* times the assessed value. For example, the owner of a home assessed at $20,000 (supposed to be worth $80,000 at the time) who lives in an area where the total tax rate is $11.00 per $100 assessed valuation (or 11%), would have to pay $2,200 that year in property taxes. Since property owners face that large expense at once — while sales taxes, and even income taxes, are spread out over the year — the annual mailing of property tax notices sparks protests over both assessment increases on particular pieces of property and the general level of public expenditures.

Assessed valuation and tax rates vary from area to area. For instance, in 1976-77 (public agencies generally work on a fiscal year running from July 1 of one year to June 30 of the next), San Jose had a total assessed valuation (or tax base) of $3,000 per resident. The city of Palo Alto, had a much higher assessed valuation of $6,800 per capita. San Jose's city tax rate was $1.705 per $100 a.v., but Palo Alto's was only $.83. Coincidentally, both cities ended up with total property tax revenue of about $50 per resident ($53 for Palo Alto, $50 for San Jose).

Within certain limits — including voter approval — cities and school districts can set their own tax rates. The San Jose city government, deciding that it needed about $29 million from property taxes to operate the city in 1976-77, set its tax rate at $1.705. Because San Jose is poorer, as a city — that is, it has a lower assessed valuation per person — than Palo Alto, its residents must pay higher property taxes on property of the same value. For example, the owners of a $50,000 home in San Jose pay as much to their city government as the owners of a $100,000 house in Palo Alto. Of course, San Jose could reduce the tax rate, and thus city revenues, but this would reduce city services.

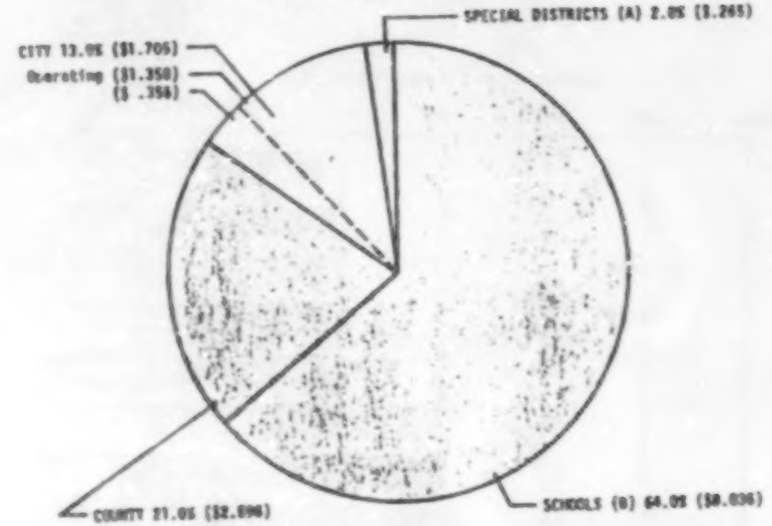
Palo Alto's per capita tax base is bigger than San Jose's for two reasons. First, as a town of several exclusive and high income neighborhoods, the average residential unit is worth more than the average home or apartment in San Jose. Second, it contains a disproportionately large amount of industrial property.

It is possible for cities to develop a strong tax base with residential property. For instance, Los Altos Hills, which contains no commercial or industrial property, has the second highest assessed valuation (per resident) in the county. But a rich residential tax base is beyond the reach of San Jose, unless all its residents become extremely rich, like the people in Los Altos Hills.

Most cities, with an average or below average income level, attempt to construct a strong tax base by encouraging industrial and commercial development. Most of the cities within Santa

PROPERTY TAX LEVIES
1975-76
For Tax Code Area 40-001*

$12.602 = 100%



(A) SPECIAL DISTRICTS

Santa Clara Valley Water		
Central	$.100	
District	.021	
Water Fund	.070	
Zone W-1	.018	
Total		$.249
Bay Area Air Pollution		.016
TOTAL SPECIAL DISTRICTS		$.265

(B) SCHOOLS

San Jose Unified School Maintenance	$ 6.068
Elementary/Unified Bonds	.661
San Jose Community College Maintenance	1.019
County School Service	.050
Juvenile Hall Schools	.024
Capital - County Schools	.049
Development Centers - Handicapped	.021
Institution Tuition Tax	.017
Equalization Aid	.037
Special Trainable Minors Tax	.025
Physically Handicapped - San Jose Unified	.057
TOTAL SCHOOLS	$ 8.036

*This tax code area is the City's largest in terms of total assessed value and is taxed at the maximum San Jose debt service rate.

A typical San Jose tax rate includes many districts, with schools drawing a majority of the property tax dollar.

Clara County have zoned the largest portions of their vacant land for industrial, rather than residential development. Some cities, such as Palo Alto, have permitted the environment to deteriorate — in Palo Alto this has taken the form of increased congestion — in their competition for industrial growth. Santa Clara has offered low electrical rates and even — in the case of Marriott's amusement and industrial development — helped finance a special freeway overpass.

Largely because of Stanford University's role in originating, attracting, and actually providing prime land for industrial growth, north county cities have proportionately much larger industrial tax bases than San Jose and its neighbors. Reliable figures on the size of industrial tax bases in Santa Clara County cities are not available, but the uneven distribution is obvious. Within the city of Palo Alto, Stanford University's Industrial Park (not including the shopping center) had an assessed value of over $95 million in 1974-75. Had that industry, by no means all of Palo Alto's industrial property, been in San Jose, it would have increased the larger city's tax base by 6%, adding $1.7 million to the city's income.

It is not merely a mathematical exercise to consider what would happen if the industry were in San Jose — or if the residents that San Jose now serves lived in Palo Alto. This is because so many San Jose residents work in the Palo Alto area. Central county residents help pay property taxes in Palo Alto by working in Palo Alto factories. The income they help generate pays the property taxes of their employers.

FUNDING THE SCHOOLS

The income disparity between school districts is equally dramatic. North county districts have strong tax bases. Central county districts are poor. For instance, in 1975-76, the Palo Alto Unified School District had well over twice the assessed valuation per high school student (based on attendance figures) as the East Side High School district in San Jose, and three to six times the assessed valuation per student as the elementary school districts — Alum Rock, Berryessa, Evergreen, Franklin-McKinley, Mt. Pleasant, and Oak Grove — served by East Side high schools.

Palo Alto, however, does not have the highest tax base per student in the county. The Los Altos-Mountain View High School District and the Mountain View Elementary School District are richer, largely because there are relatively few children living in Mountain View's apartments. But those apartments do not generate a large amount of residential property tax. Mountain View relies on its industrial belt to supply a substantial portion of its property taxes.

District	Modified assessed valuation per unit of second period a.d.a., 1975-76 Elementary	High school
Campbell H.S.		40,931
Cambrian Elementary	22,371	
Campbell Elementary	30,250	
Luther Burbank Elementary	24,380	
Moreland Elementary	21,355	
Union Elementary	14,544	
East Side H.S.		40,473
Alum Rock Elementary	9,100	
Berryessa Elementary	12,487	
Evergreen Elementary	14,544	
Franklin-McKinley Elementary	18,024	
Mt. Pleasant Elementary	9,713	
Oak Grove Elementary	15,286	
Orchard Elementary	224,871	
Fremont H.S.		58,250
Cupertino Elementary	22,013	
Montebello Elementary	62,372	
Sunnyvale Elementary	48,575	
Gilroy Unified	21,817	54,301
Los Gatos H.S.		51,840
Lakeside Elementary	40,483	
Loma Prieta Elementary	29,432	
Los Gatos Elementary	35,050	
Saratoga Elementary	31,759	
Milpitas Unified	16,403	39,482
Morgan Hill Unified	23,308	58,881
Mountain View-Los Altos H.S.		100,480
Los Altos Elementary	52,872	
Mountain View Elementary	64,499	
Whisman Elementary	37,896	
Palo Alto Unified	58,734	96,010
San Jose Unified	26,282	94,935
Santa Clara Unified	35,950	68,393

Within the county, the tax base of school districts varies considerably. North county districts have considerably larger assessed valuations, per student, than school districts in the San Jose area.

With their larger tax bases, north county districts can raise more funds than San Jose schools while actually applying a lower tax rate. Although the tax rate of the San Jose Unified School District is substantially higher than Palo Alto's School District ($6.45 vs. $5.34 per $100 a.v.), Palo Alto raised $1,900 per student from property taxes in 1975-76, compared to $1,15 for San Jose. Similarly, the Mountain View-Los Altos High School District raised $1,775 per student on a tax rate of $1.77, versus $1,100 per student in the East Side High School District on a higher tax rate of $2.67.

EAST PALO ALTO

The unincorporated area of East Palo Alto, just across the San Mateo County line from Palo Alto, suffers most from the concentration of industry in Palo Alto. Those East Palo Altans with jobs work outside their "town," in Palo Alto, Menlo Park, and other employment centers. As the Midpeninsula's only black ghetto, East Palo Alto suffers a high crime rate, deteriorating property, and a high demand for social services. The San Mateo County Board of Supervisors, who represent 580,000 people, most of which are wealthier and more active politically than East Palo Alto's 19,000 residents, have never paid much attention to East Palo Alto's problems.

East Palo Alto's political leaders have an obvious solution — incorporation of East Palo Alto as a city. The leadership is there, and so are the plans, but the tax base isn't. With cheap housing and little industry, East Palo Alto's per capita tax base is only about $1,250, less than one third of San Jose's poor base! The area is caught in a vicious cycle. Without a citizen-controlled government to improve planning and services, as well as reduce crime, East Palo Alto cannot attract the industry which could pay for that government. There is valuable industrial development on its fringes — such as Menlo Park's Cavanaugh Industrial Park — but other jurisdictions have gerrymandered their boundaries to capture the taxes paid by the factories.

FAIR VALUE?

Though industrial property provides substantial tax revenues, homeowners' groups have charged that they should provide much more. One such organization, the Valley Coalition, conducted a study of land occupied by the Lockheed Missiles and Space Company in Sunnyvale. By comparing five sections of Lockheed land to nearby parcels that had recently been sold — the method the assessor's office uses to raise residential assessments — it found that Lockheed land was under-assessed by 30%, or more than $600,000. If such a discrepancy exists

PROPERTY TAX AS A PERCENTAGE OF SCHOOL DISTRICT REVENUE, 1975-76

Campbell High School	55.5
Cambrian Elementary	51.0
Campbell Elementary	62.5
Luther Burbank Elementary	51.2
Moreland Elementary	52.9
Union Elementary	45.8
East Side High School	55.2
Alum Rock Elementary	22.9
Berryessa Elementary	32.3
Evergreen Elementary	38.1
Franklin-McKinley Elementary	38.8
Mt. Pleasant Elementary	30.9
Oak Grove Elementary	35.5
Orchard Elementary	74.8
Fremont High School	71.9
Cupertino Elementary	82.7
Montebello Elementary	88.0
Sunnyvale Elementary	73.5
Gilroy Unified	53.0
Los Gatos High School	72.5
Lakeside Elementary	83.4
Loma Prieta Elementary	84.8
Los Gatos Elementary	75.5
Saratoga Elementary	89.0
Milpitas Unified	43.9
Morgan Hill Unified	59.6
Mountain View-Los Altos High School	75.9
Los Altos Elementary	76.7
Mountain View Elementary	78.4
Whisman Elementary	66.5
Palo Alto Unified	78.2
San Jose Unified	60.5
Santa Clara Unified	71.7

The differences in tax bases mean that certain school districts get more money from local taxes. This means they can afford to spend more per student, and it also means that property taxes provide a larger percentage of their budgets.

county-wide, it is causing a massive underpayment of industrial taxes.

SERVICES

Obviously, the high technology industries of Santa Clara County place a demand on local agencies for services. Other than for utilities, however, no one keeps track of which services are provided to industry per se. Most city planners agree that the relatively clean local industries do not cost local government much money. More money is spent on providing police and fire protection, planning, and educational services to residents. City councils, which budget the services, rarely discuss services for industry.

However, the electronics assembly industry has indirectly increased the demand for one particular service, child care. By providing employment to large numbers of young women, many of whom have children, it has created a need for increased babysitting and child care centers. So far, industry has ignored the problem. Child care officials have asked several major companies to support child care programs, but they were turned down.

Even if the industry, local schools, and the cities get together to provide additional child care, programs would be hampered by the same commute pattern that affects the tax structure. Should programs be provided in San Jose neighborhoods, where the production workers live, they would have difficulty raising funds from property taxes. More important, parents feel uncomfortable leaving their kids at centers far from their workplaces, since it is difficult to respond quickly should emergencies arise.

Child care centers provided near factories are more convenient, but they remove children from their own neighborhoods. On-site factory child care would probably create a more stable, satisfied workforce, but companies are unwilling to go into the social service business and many parents are justifiably unwilling to give the corporations a role in bringing up their children.

POLICIES

There are five basic types of policies that have been proposed to reduce the inequality in local tax bases. Agencies can be consolidated. Taxes can be shared. New types of taxes can replace property taxes. Cities can alter zoning. And public agencies can take over control of the siting of industrial production.

Consolidation. Simply, this means creating larger cities, larger school districts, or even regional government. It would solve tax disparities by including rich and poor areas in the same budget. As with any program to equalize tax revenues, consolidation has been opposed by richer agencies — witness the attempts to consolidate elementary school districts in Los Altos and Mountain View. More important, citizens would lose access to public officials, which they have, to some extent, in small agencies. Furthermore, poor residents in large cities with substantial tax bases — San Francisco, for instance — do not necessarily get adequate services.

Tax sharing. Either through cooperation between local government, or through state intervention, tax revenue from one jurisdiction can be passed to another. In one form, this is being practiced by the State of California, which, because of the famous *Serrano vs. Priest* court decision, must try to smooth out the spending disparities between school districts. Under recent state legislation, the state places limitations on taxation by local districts while offering larger amounts of state assistance to poor districts. It is too early to know how well the state plan will work, but without a doubt it will increase state authority over local school districts.

Alternate taxes. It seems that everyone wants to find an alternative to the property tax, but no one can come up with a package that wins widespread support. Financing local cities and schools through income taxes on residents or commuters would help some areas, but it would leave other areas with little industry and/or poor residents with inadequate revenue.

Zoning. Since the root of the tax disparity problem is in the county's land use pattern, zoning could be used to help solve it. Most of the cities in Santa Clara County have zoned vacant land for industry, reserving very little for housing. In the north

county, there is little room set aside for residential development, and that which is built is generally for higher income people without children. Cities — particularly Palo Alto — which import lower income workers can alter zoning and create incentives to increase the availability of housing for workers. However, they are unwilling to do so without pressure. Whether the cities are convinced or forced to alter their plans, it will mean that the residents of exclusive neighborhoods will have to accept less affluent neighbors.

Should housing for workers — especially workers with children — be provided near existing industry, this would also improve the quality of child care. Children could be cared for within their neighborhoods, yet be close to their working parents.

Industry siting. Most discussions of the Santa Clara County commute pattern focus on city and county planning, for those are the most logical areas for immediate reform. The source of the problem lies much deeper, however. Industries have concentrated in the north county because it is most profitable, in general, for them to do so. They are closer to Stanford, the most attractive housing for managers and engineers, and to other high-technology firms. While it may be most profitable for the company stockholders and financiers, it is not profitable for the citizens of the county as a whole. Local, regional, and state governments could minimize the social costs of industrial development by actively siting plants. This could be done through regulation, or by active investment from a state development bank — such as the proposed bank for state pension funds. However, the companies and a sizable number of citizens would oppose such an approach because it tends toward socialism.

Regardless of the particular solution to regional tax inequity, at this time the most important step is to win recognition that there is, in fact, a problem to be solved.

Silicon Valley's
Public Interest Information Center

A decade ago hardly anyone had heard the term "Silicon Valley." Today it is a almost a household word in all corners of the globe. Northern Santa Clara County, the heart of Silicon Valley, is universally considered the world's leading center of high technology electronics. Economic delegations from lands as diverse as Ireland, North Carolina, and Malaysia visit the Valley to entice some of its magical business, for the image of Silicon Valley is as shiny as the silicon wafers from which integrated circuits - chips - are made.

Silicon Valley and its technologies are indeed remarkable. But the rapid growth of high technology electronics has created problems as well. Many young engineer-entrepreneurs have made millions in the boom, but many more production workers in Silicon Valley and other U.S. production sites eke out little more than the minimum wage. The industry provides fantastic opportunities for highly educated white men, but women and minorities are concentrated at the bottom of the occupational ladder. In addition, hundreds of thousands of women in Asia and Latin America assemble chips and electronic equipment for the same companies, at a fraction of U.S. pay.

While the industry has brought prosperity to Santa Clara County, the social and environmental costs are growing. High housing costs and traffic congestion result directly from the concentration of industry. Though the factories look like modern college campuses, workers inside and occasionally the communities outside are exposed to a variety of toxic chemicals and hazardous wastes. The theft of both hardware and ideas - "trade secrets" - is posing complex problems for law enforcement.

Unless used properly, high technology electronics can create as many problems as it solves. The 1982 wars in the South Atlantic and Lebanon demonstrated how chips have pervaded conventional warfare. Advances in electronic guidance, satellite reconnaissance, and anti-submarine weaponry are extending the nuclear arms race into space and the deep ocean. Computers may soon replace the presidential "button."

While chips could liberate people from unpleasant tasks in the factory, office, and home, they are already throwing vast numbers of people out of work or into other occupations. In many cases, the new positions are even less rewarding - workers are becoming adjuncts of machines. Computers may revolutionize education, but basic skills may suffer as funds are shifted into what may be a high-tech fad. Meanwhile, high-tech video games are absorbing the attention, creativity, and quarters of America's youth.

The Pacific Studies Center believes that chips and computers pose both enormous promise and peril. Its books, magazines, and clipping files contain valuable information on the social, economic, and environmental issues surrounding the "semiconductor revolution." In the past year, PSC resources on Silicon Valley have been used by workers in Malaysia, environmental activists in North Carolina, UN-sponsored scholars in Germany, network news shows, and the U.S. Civil Rights Commission. You might find PSC's resource center useful, too.

ANNEXE XIV

Documentation sur Stanford University: Decker F. Walker

REPRINTED FROM THE OCTOBER 1983 PHI DELTA KAPPAN

REFLECTIONS ON THE EDUCATIONAL POTENTIAL AND LIMITATIONS OF MICROCOMPUTERS

by Decker F. Walker

What will remain in the schools when the computer boom has run its course? A "hardened veteran of educational revolutions" gives a qualified vote of confidence for this "substantial and exciting" — but distinctly limited — educational resource.

THE AMERICAN love affair with the personal automobile appears to be cooling after more than half a century. Many people think the new love in our lives will be the personal computer. Such headlines as "Computer Boom Hits Schools" and "Electronic Classroom Seen Within Decade" trumpet a "computer revolution" in education. Even the Council for Basic Education featured "Education in the Computer Era" in the October 1981 issue of *Basic Education*. In times as lean as the present, the amount of attention, energy, and resources being devoted to computers in education is remarkable.

The "revolution" supposedly prompted by computers in classrooms may pass in a few years, going the way of such earlier "revolutions" as back-to-basics, career education, mainstreaming, education of the disadvantaged, open education, programmed learning, new math, and discovery learning. Or, like chalkboards, overhead projectors, maps, textbooks, workbooks, and activity sheets, computers may become just another part of the trappings of the everyday classroom.

It is impossible to predict how long computers-in-education will hold the spotlight of public and professional attention. Five years would be an excellent run; 10 years would be the best since progressive education. What concerns me, however, is not the length of the run but what will remain in the schools when the boom has run its course and a new act has captured the spotlight. When that happens, the fate of computers-in-education will depend on the instructional uses to which teachers and students can put their computers.

As a student of elementary and secondary school curricula, I have witnessed the parade of reforms and innovations since Sputnik and have marched in many of them myself. My first experience with the science and math reforms of the late Fifties and Sixties was disillusioning. I was dismayed to discover that we had been unrealistic in our expectations of students and teachers, and I was shocked to see unquestioned benefits of the reform movement — such as expanded laboratory work in science and greater emphasis on problem solving — rejected along with its excesses. Now, 20 years later, I would call myself a hardened veteran of educational revolutions. And yet I find myself excited by the educative potential of microcomputers — not just the dream machines of tomorrow but also today's Apples, Ataris, TRS-80s, PETs, and IBMs.

In an effort to avoid repeating my past mistakes, I have tried to assess carefully and objectively the potential and the limitations of today's microcomputers as educational aids. Briefly, I believe that today's microcomputers represent a substantial and exciting educational resource but one with distinct limitations. And I believe that exploiting this resource will be a difficult and dangerous undertaking for schools.

The Potential of Micros Today

What can students learn or teachers teach using computers that they could not do, or could do only with difficulty, otherwise? This is the fundamental question. My experience — derived from three years of reading, thinking, and working with computers and computer-based education programs — leads me to identify seven main ways that today's microcomputers can contribute to education. These are: 1) more active learning, 2) more varied sensory and conceptual modes, 3) less mental drudgery, 4) learning nearer the speed of thought, 5) learning better tailored to individuals, 6) more independent learning, and 7) better aids to abstraction. I will comment briefly on each of these capabilities.

1. *More active learning*. One of the most universal pleas of educational reformers from John Amos Comenius to John Holt is for more active learning. And one of the most consistent findings of educational research is that learning of all kinds is enhanced when learners can *do* something with what they are learning and see the results of what they have done. Computers can be programmed to call for repeated input from users and to respond immediately to that input. Thus students can attempt learning activities and can receive feedback on their attempts — a level

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> COMPUTERS CAN MATCH THE PACE AND TIMING OF A PRESENTATION TO A LEARNER'S OWN REQUIREMENTS.

of activity not possible while reading or listening to a teacher. This accords well with youngsters' inclinations to be busy, to get into things, to make an impression on the world around them.

Computers are *interactive*. A computer is not merely a medium for presenting materials to be learned nor simply a medium of expression for students. It is both, and more. A computer is also a device for processing a student's response and determining in a split second where to go from there. A computer can present a new stimulus that acknowledges a student's former response not only verbally but in content, appearance, and timing. Thus students clearly see that their input counts, that the program is responding to what they do.

This interactive capacity is overlooked by many critics of computer-based drill-and-practice, who sneer at "electronic flash cards," "electronic workbooks," and "the electronic page-turner." Even these most rudimentary uses of computers are more involving than their printed counterparts, which neither acknowledge nor respond to student input.

2. *More varied sensory and conceptual modes.* Microcomputers as they come from the store can display letters and simple shapes in color; they can play single tones of varying pitch, duration, and loudness. They will accept input from typewriter keyboards, game paddles, joysticks, light pens, or digitized drawing pads. But the machines can be connected electronically with any device that can be made to generate or respond to an electronic signal. For example, reasonably priced equipment is now available that can link microcomputers with videotape or videodisc players, electronic musical instruments, scientific instruments, physiological monitoring equipment, household appliances, and other computers. This makes a computer an enormously versatile teaching tool.

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REPRINTED FROM THE OCTOBER 1983 PHI DELTA KAPPAN

Reflections on the Educational Potential And Limitations of Microcomputers

by Decker F. Walker

What will remain in the schools when the computer boom has run its course? A "hardened veteran of educational revolutions" gives a qualified vote of confidence for this "substantial and exciting" — but distinctly limited — educational resource.

THE AMERICAN love affair with the personal automobile appears to be cooling after more than half a century. Many people think the new love in our lives will be the personal computer. Such headlines as "Computer Boom Hits Schools" and "Electronic Classroom Seen Within Decade" trumpet a "computer revolution" in education. Even the Council for Basic Education featured "Education in the Computer Era" in the October 1981 issue of *Basic Education*. In times as lean as the present, the amount of attention, energy, and resources being devoted to computers in education is remarkable.

The "revolution" supposedly prompted by computers in classrooms may pass in a few years, going the way of such earlier "revolutions" as back-to-basics, career education, mainstreaming, education of the disadvantaged, open education, programmed learning, new math, and discovery learning. Or, like chalkboards, overhead projectors, maps, textbooks, workbooks, and activity sheets, computers may become just another part of the trappings of the everyday classroom.

It is impossible to predict how long computers-in-education will hold the spotlight of public and professional attention. Five years would be an excellent run; 10 years would be the best since progressive education. What concerns me, however, is not the length of the run but what will remain in the schools when the boom has run its course and a new act has captured the spotlight. When that happens, the fate of computers-in-education will depend on the instructional uses to which teachers and students can put their computers.

As a student of elementary and secondary school curricula, I have witnessed the parade of reforms and innovations since Sputnik and have marched in many of them myself. My first experience with the science and math reforms of the late Fifties and Sixties was disillusioning. I was dismayed to discover that we had been unrealistic in our expectations of students and teachers, and I was shocked to see unquestioned benefits of the reform movement — such as expanded laboratory work in science and greater emphasis on problem solving — rejected along with its excesses. Now, 20 years later, I would call myself a hardened veteran of educational revolutions. And yet I find myself excited by the educative potential of microcomputers — not just the dream machines of tomorrow but also today's Apples, Ataris, TRS-80s, PETs, and IBMs.

In an effort to avoid repeating my past mistakes, I have tried to assess carefully and objectively the potential and the limitations of today's microcomputers as educational aids. Briefly, I believe that today's microcomputers represent a substantial and exciting educational resource but one with distinct limitations. And I believe that exploiting this resource will be a difficult and dangerous undertaking for schools.

The Potential of Micros Today

What can students learn or teachers teach using computers that they could not do, or could do only with difficulty, otherwise? This is the fundamental question. My experience — derived from three years of reading, thinking, and working with computers and computer-based education programs — leads me to identify seven main ways that today's microcomputers can contribute to education. These are: 1) more active learning, 2) more varied sensory and conceptual modes, 3) less mental drudgery, 4) learning nearer the speed of thought, 5) learning better tailored to individuals, 6) more independent learning, and 7) better aids to abstraction. I will comment briefly on each of these capabilities.

1. *More active learning*. One of the most universal pleas of educational reformers from John Amos Comenius to John Holt is for more active learning. And one of the most consistent findings of educational research is that learning of all kinds is enhanced when learners can *do* something with what they are learning and see the results of what they have done. Computers can be programmed to call for repeated input from users and to respond immediately to that input. Thus students can attempt learning activities and can receive feedback on their attempts — a level

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DECKER F. WALKER is an associate professor in the School of Education at Stanford University, Stanford, Calif. ©1983, Decker F. Walker.

COMPUTERS CAN MATCH THE PACE AND TIMING OF A PRESENTATION TO A LEARNER'S OWN REQUIREMENTS.

of activity not possible while reading or listening to a teacher. This accords well with youngsters' inclinations to be busy, to get into things, to make an impression on the world around them.

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Programs can be written to monitor students' progress through lessons, to note errors and offer extra practice or more instruction where performance is weakest, and to offer help and advice whenever students ask for it. Instead of poring over a puzzling equation for hours, fruitlessseeking the source of one's misunderstanding, a session with a good program would detect the problem and provide assistance quickly. For the highly motivated student, such help can make the difference between being able to learn independently and being forced to find a teacher -- an option that is not always open.

7. ***Better aids to abstraction.*** The authors of *The Mathematical Experience*, Philip Davis and Reuben Hersh, tell of years of effort spent trying to develop an intuition, a feel for working with hypercubes (four-dimensional cubes). They even viewed a computer-generated film, created by a mathematician and a computer scientist at Brown University, which showed what one would see if a hypercube passed through our three-dimensional space at various angles. They found the film impressive but insufficient.

"When I saw the film . . . I was impressed by [the filmmakers'] achievement and by the sheer visual pleasure of watching it. But I felt a bit disappointed; I didn't gain any intuitive feeling for the hypercube."[7] Later, the filmmakers gave one of the authors a chance to sit at the controls of the computer and manipulate the hypercube.

"I tried turning the hypercube around, moving it away, bringing it up close, turning it around another way. Suddenly I could *feel* it! The hypercube had leaped into palpable reality as I learned how to manipulate it, feeling in my fingertips the power to change what I saw and change it back again. The active control at the computer console created a union of kinesthetics and visual thinking which brought the hypercube up to the level of intuitive understanding."[8]

This is the sort of insight into abstractions that the computer alone can provide. Gavriel Salomon, an Israeli researcher, suggests that once a person has experienced an abstraction in this way, he or she soon gains the power to internalize it and operate on it mentally, just as we can deal with words and images intuitively.

The act of programming itself can be an aid to understanding abstraction. When we write a program, we represent complicated processes precisely and directly. Learning to write clear, complete instructions that enable a machine to carry out a task is every bit as difficult as (and perhaps more useful in an electronic age than) learning to do arithmetic computations. Writing even a simple program is a form of abstraction that is closely akin to action, and for that reason it may be more accessible to young people than the static symbolic forms we have traditionally struggled to teach them.

Computer graphics and computer simulation are also powerful new means of representing ideas and relationships in ways that permit us to act on them and to see the consequences. Computers can be programmed to create model worlds that operate according to a combination of strict rules and random processes and to give students complete control over them. These simulated worlds should be powerful aids to conceptual learning and thinking, enabling students to learn abstract relationships more easily than by merely reading about them.

Take, for example, computer games such as StaRaiders that create fantasy worlds that players can act within — in this case, a world of spaceships, interstellar travel, and battle. This sort of program could also be used to permit exploration of a real solar system or universe. The same techniques permit the exploration of worlds too small, too fragile, too dangerous, or too complex for actual study in the classroom. Using simulation techniques, students will be able to explore individual cells and molecules, the interior of a living organism, the actual mechanism of an internal combustion engine, or the workings of a national economy.

Over the millennia, human beings have developed the capacity to learn from their experience in exploring new environments. The computer enables us to use this capacity to understand virtually any system whose rules we can discover.

THESE ARE seven very substantial strengths that the computer can bring to education now. These are the resources, the raw materials, from which we must create the drill-and-practice programs in math and language arts, the writing programs that use word processors, the science simulations, the music theory and ear-training systems, the computer-aided design programs, the programs that explore social studies data bases, the computerized tests, and the dozens of other applications of microcomputers to education.

THE COMPUTER ENABLES US TO UNDERSTAND VIRTUALLY ANY SYSTEM WHOSE RULES WE CAN DISCOVER.

The potential of computers in education is very great, but it is not unlimited. Let me now turn to some of the computer's limitations.

Limitations of Micros

The following seven problems seem to me to be the most severe limitations of today's microcomputers. 1) Microcomputers can supplement conventional education, but they cannot substitute for it. 2) Today's microcomputers are hard to use, and teachers prepared to use them are in short supply. 3) New products and systems are being created and marketed in such profusion, with such speed, and with so little standardization that systematic, long-term planning is nearly impossible. 4) Good programs are scarce because creating them for today's microcomputers is difficult, time-consuming, and expensive. 5) We are only beginning to understand how to use microcomputers in education; therefore, it is easy for a school or teacher to err, look foolish, or do harm. 6) Programs for teaching explicit, formal models can be created readily with known techniques, but it is much more difficult to use computers to teach subject matter that involves judgment, intuition, improvisa-

"Well, today we learned to reorder segments on a random-access videodisc through the process of microcomputer interfacing."

tion, and creativity. 7) Microcomputers will not solve (and may aggravate) several of the most serious current problems confronting education — notably equity, school finance, and divergent public expectations.

Each of these limitations deserves some elaboration.

1. *Supplement, not substitute.* Independent study, home learning, and distance learning all have low rates of completion. Their chief problem is to sustain motivation and participation in the absence of a learning group, a teacher, and a social structure. The studies of computer-based education reported in the literature cover only uses of the computer as part of an ongoing class or school. Although computers have generally been successful in these studies,[7] the leap from this supplementary use to independent study via computer is a giant one.

I have seen only one study that investigated the use of computers for formal study outside the school and classroom. Patrick Suppes[8] supplied unlimited access to computer terminals for computer-assisted instruction (CAI) to a total of 26 very bright students (Stanford-Binet I.Q. scores of 165 or higher) in the sixth, seventh, and eighth grades for periods ranging from six months to a year. Six of these students requested the manual for one of the two courses offered (BASIC), and only two finished the course. After six months, four students completed the other course offered (logic), two were working slowly and irregularly, and two of those who had originally begun the course had dropped out. Because many of the students were not working regularly toward completion of any course material, Suppes set weekly individual goals — a move of which students approved. But even weekly goals did not change their work habits. This discouraging experience led Suppes to conclude that more attention should be given to measures such as short-term goal setting, telephone contacts with proctors, grading, academic credit, and the like — measures that provide structure and guidance and thus help sustain participation.

Even though computers seem to ease the problems of distance learning, we are a long way from sustaining a mass educational system via computer. Indeed, we have not yet demonstrated that it can be done at all. At least for the next decade, computers will be strictly supplementary to conventional forms of education.

2. *Microcomputers are hard to use.* Our experience at the Microcomputer Institute for Educators at Stanford University during the past two summers indicates that highly motivated teachers can learn to use microcomputers for CAI, learn to program in BASIC, and learn to work with youngsters in computer literacy and computer programming courses in six weeks of full-time study, six hours a day, five days a week — a total of 120 hours. Perhaps this figure could be reduced somewhat by careful planning. But what remains would still require more hours of study than any single semester-long college course.

> **THE INTRODUCTION OF COMPUTERS WILL REQUIRE CHANGES IN THE DAY-TO-DAY OPERATION OF CLASSROOMS.**

And such a course of study is only a beginning for an educator who wants to use computers professionally. Each computer has its own way of doing things, which must be learned anew regardless of prior experience. Each of the half dozen or so computer languages in widespread use requires further hours of study. Utility programs — word processors, data-base management systems, electronic spreadsheets, and so on — also require further study. And the amount of arbitrary but essential detail that must be mastered to use any piece of microcomputer hardware or software is large enough to be intimidating to many and infuriating to nearly everyone. Each new round of products is more "user-friendly," but it will be years before microcomputers are as easy to use as movie projectors — machines that are already too complex for many teachers.

3. *Rapid change and lack of standardization.* When products are changing rapidly and each one has its own peculiarities, the return on the investment of time and energy in learning to use the system is low. As soon as you've mastered one system and become comfortable with it, another one becomes available that does 10 times as much and costs one-tenth as much. The only problem is that it will take you a year to learn the new system.

Schools do not have the resources to provide continuous inservice training for ever-changing computer systems, nor will teachers continue indefinitely to give up their spare time. In addition, software and accessories purchased for existing machines may not work with the next generation, and they will certainly be incompatible with competitors' machines.

Policy makers face the choice of investing in today's systems and forgoing the new ones, or, perhaps worse, they see that this same painful choice will continue to confront them indefinitely. This makes long-term planning nearly impossible and militates against the economies of scale that could come from coordinated programs of adoption and purchase.

Perhaps standardization will eventually come to the computer industry. But I do not expect it within the next five years and probably not within the next decade.

4. *Scarcity of good programs.* Most teachers adapt curriculum materials and activities for their classes. Some create new activities, and a few of these write up their creations for publication in professional books or journals. Only occasionally is a teacher also a developer of commercially published curriculum materials. Developing software for computers is at least an order of magnitude more difficult than developing print materials that occupy a similar amount of instructional time. In order to develop software, a teacher must be able to program as well as to write. And a great many more instructional decisions must be made if the additional capabilities of the machine — timing, handling students' responses, feedback, and so on — are to be exploited.

Larger, more expensive microcomputer systems can make the software designer's job easier by providing such aids as utilities programs for graphics, to make drawing on the screen easier; authoring languages, to make programming easier; and standard subroutines, to handle errors more efficiently. Within the next decade, even more sophisticated tools will become widely available, further simplifying the design of software. But educational software design will remain a highly skilled craft that few will master, and the shortage of good software will continue.

5. *Nobody yet understands how to use computers well for education.* The only thing that is absolutely clear is that the introduction of computers will require changes in the day-to-day operation of classrooms. Most of the time in today's classrooms is spent with teachers talking and children listening. (Two-thirds of all classroom time is spent this way, researchers say.) It will be more difficult to talk over the clatter of keys.

The most extensive and ambitious evaluations of education programs that use computers have studied programs in which computers were used for only two or three hours per week for less than an academic year. Students generally worked by themselves on simple drill-and-practice routines or tutorials. We do not know what would be the consequences of extensive use of simulations for concept learning, of extensive use of computers for inquiry by small groups of youngsters, or of giving youngsters access to massive libraries of data. We will simply have to try different ways of using computers and carefully assess the results as we go.

THE COMPUTER PIONEERS WILL BEAR THE BURDENS AND ENDURE THE DANGERS OF EXPLORATION.

6. *Formalism favored over judgment.* Computers handle rule-based procedures more quickly and accurately than any human being can, *once the system of rules and procedures has been worked out.* The field of artificial intelligence takes upon itself the task of discovering the extent to which those human capabilities we regard as intelligent can be represented in rule-governed procedural models and therefore programmed for computers to carry out. Perhaps at some point we will discover that everything we now regard as intelligent about human behavior can be programmed for computers. Consider the adjustment such a discovery would require in the self-image of our species. In the meantime, people can do many clever and important things far better than their ersatz kin – carry on conversations, make jokes, create art, invent art forms, build theories, infer intentions from behaviors, and, in general, handle novelty and ambiguity.

Using today's microcomputers, we can construct quite complex formal models, and these can be used to help teach students how to work with formal systems of knowledge. Mathematics lends itself to computer treatment, of course, but so do spelling, grammar, punctuation, those parts of science that treat formal theories and their consequences (e.g., the physics of motion or calculations involving chemical equilibrium), skills such as typing, masses of arbitrary facts (called data bases) that appear frequently in history and geography – in short, much of the standard curriculum of elementary and secondary education.

But not all. Literature, the arts, mathematical invention, scientific applications, those parts of science as yet unformalized, those parts of the social studies that require a broad or deep understanding of human interaction – in short, much of what has traditionally been considered the core of the humanities – remain unformalized, not yet reducible to formal rules and procedures. Computers *can* be used to help teach these "soft" subjects, but their application is neither simple nor straightforward. And the difference between a student working with a computer and the same student working with a qualified teacher is much greater in these areas.

7. *Computers will not solve current school problems.* Computers will not bring racial balance to segregated schools or racial harmony to integrated ones. They will not redress inequities in funding between schools in rich and poor areas, nor will they overcome subtler inequities in the quality of education that stem from differences in race, ethnic group, gender, or socioeconomic class. Funding levels for education do not appear likely to rise because of microcomputers. Rival segments of the public will continue to hold contradictory expectations for schools and to struggle to impose their own views on the schools. Teachers will continue to be laid off, the teaching force will continue to age, and few talented young people will choose teaching as a career. Educators and educational leaders will still have to face these serious problems.

It is conceivable that a computer center could be run so as to harmonize the social divisions within a school and community. But unless special care is taken, computers are likely to be used mainly by middle-class male students for mathematics and science instruction. A talented, dedicated teacher or school administrator can counteract these tendencies and insure that all children have relatively equal access to computers. But this takes effort, planning, and cooperation, and nobody claims that microcomputers supply these commodities.

Since microcomputers play a supplementary role, they worsen budget problems. Even if the computers are donated to the schools, they must be maintained and repaired, people must be trained to use them, and software must be created or purchased. Thus computers still add to the cost of education.

The philosophical chasms that divide the various publics served by the schools also divide supporters and opponents of computers. Already the mark of progressive, open education can be seen on LOGO – and that of conservative educational philosophy on drill-and-practice programs. Already we can hear the clarion calls of educational sloganeers, such as, "Will the computer program the child or the child program the computer?"

As a new competitor for limited educational resources, computers are certain to arouse opposition. Computers threaten to disrupt established classroom routines and to put new pressures on teachers, so it would be surprising if some teachers did not oppose their introduction into schools. Certainly some defenders of humanist educational ideals and traditions are alarmed at the possibility that their notion of a good education will not survive the widespread use of computers. I have even heard of an organization in San Francisco that aims to combat the use of microcomputers in schools.

Summing Up

Is it worth it, then? Are the limitations too severe and the advantages too slight? Readers must judge for themselves, but for my part the answer is a complex and qualified vote of confidence for computers in education.

For some communities, some schools, and some teachers, computers are not worth it – not now, not today's microcomputers. They can wait and see what happens, buying in later if things go well, when the hardware is more stabilized and the software better developed.

But it is very important, I think, for some communities, some schools, and some teachers to embrace computer-based education wholeheartedly, to strive to make it work for them. Success in using microcomputers for education will not solve the serious educational problems schools face, but failure will leave the schools even more poorly equipped to cope with them.

Enormous practical, pedagogical, and technical problems must be solved before the potential of computers for education can be realized. Mistakes will be made. Failures will occur. Critics will have plenty to criticize. The pioneers will bear the burdens and endure the dangers of exploration, and all of those who come after will benefit from their experiences. Here is a chance for those favored by circumstance to indulge their spirit of adventure and discovery while at the same time contributing to the general welfare.

The microcomputer and its relatives, the other information technologies, are the new tools that happen to have been invented in our time. Learning to use them wisely and well is one of the major challenges we face. We have the opportunity to explore a new and very powerful medium of education and expression. How can we let that chance slip away?

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3. Philip J. Davis and Reuben Hersh, *The Mathematical Experience* (Boston: Houghton Mifflin, 1981), p. 403.

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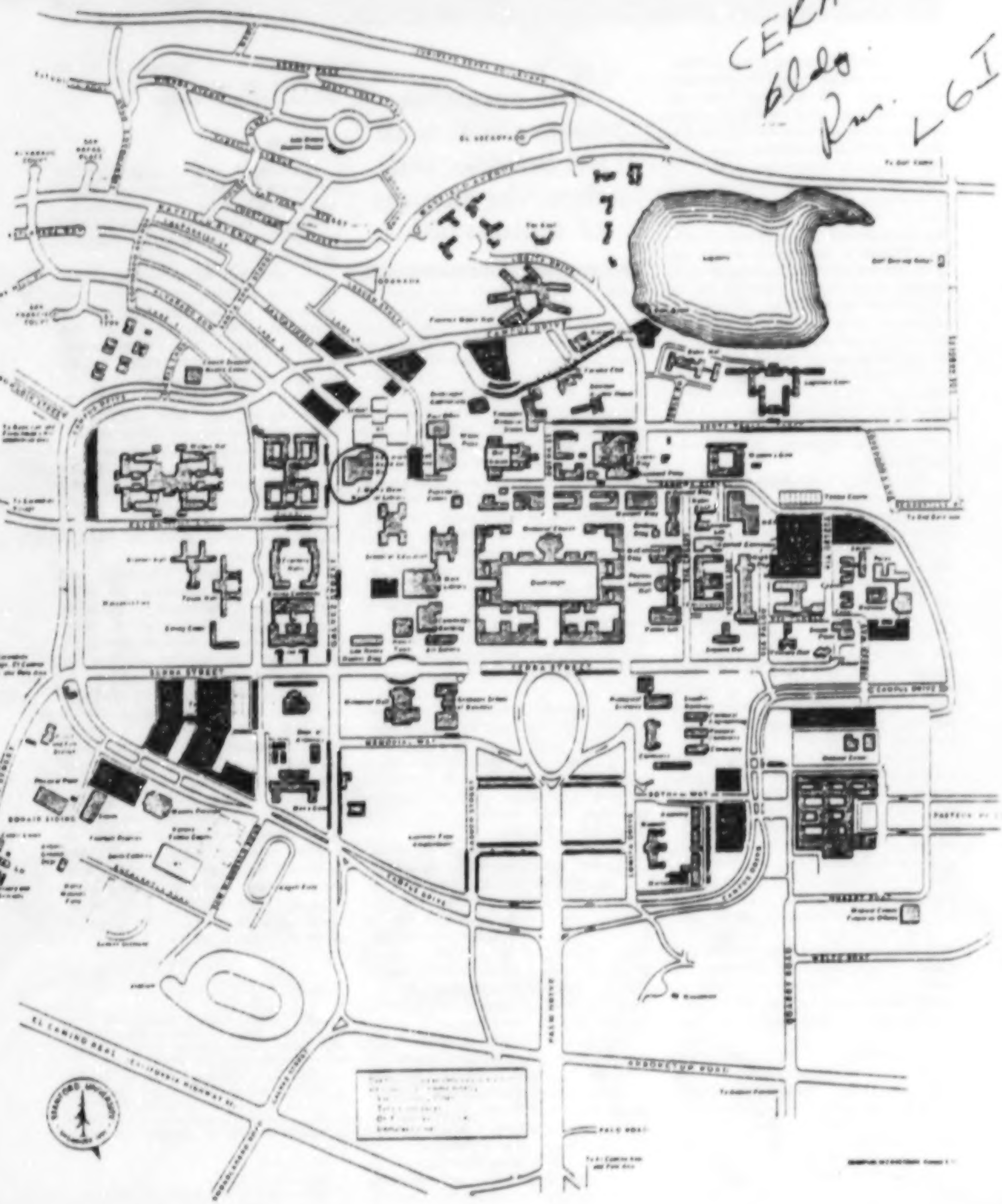

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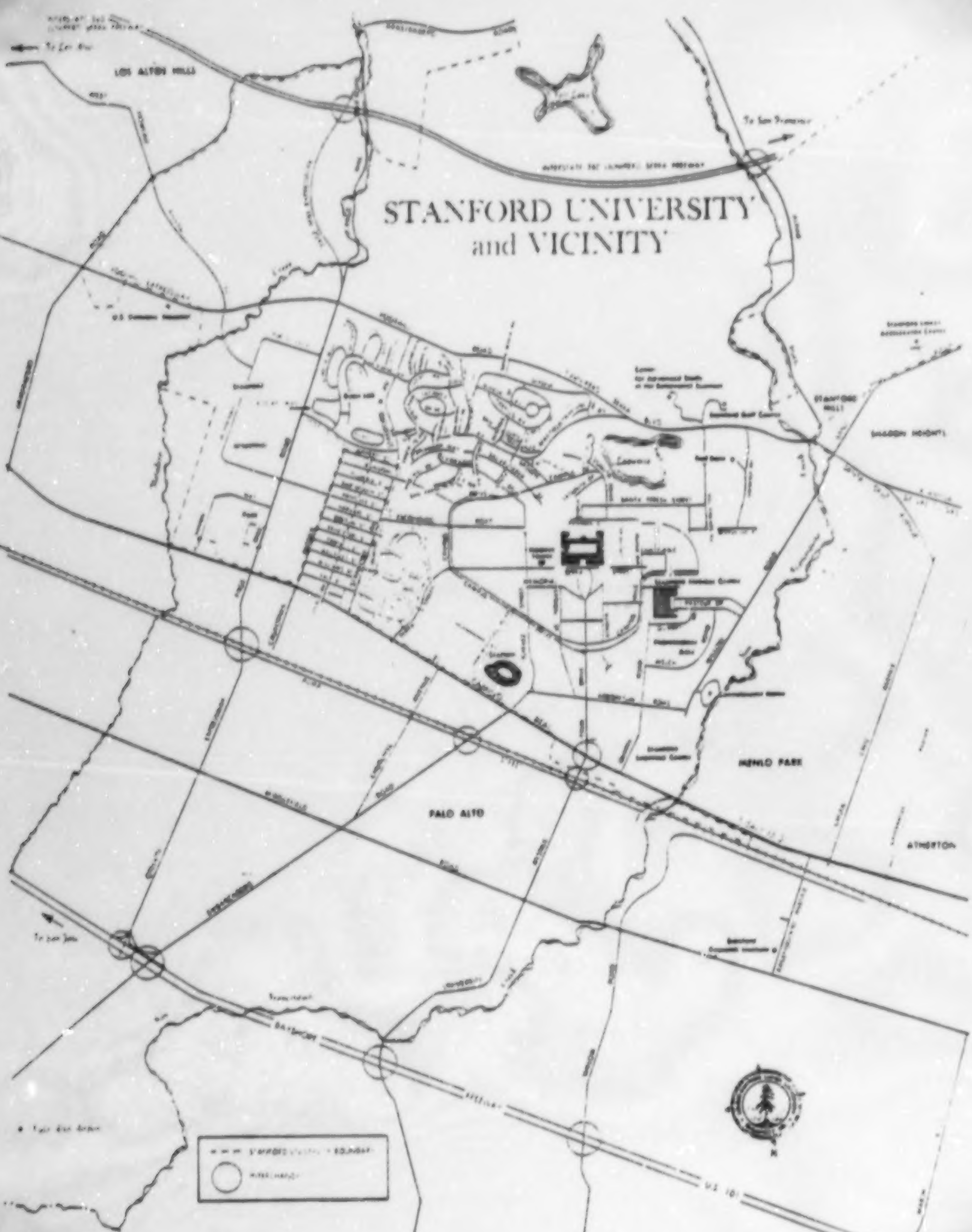
Serra Street
EL CAMINO REAL
California Highway 82
Palm Drive

STANFORD UNIVERSITY and VICINITY


To San Jose
LOS ALTOS HILLS
To San Francisco
STANFORD HILLS
SHARON HEIGHTS
MENLO PARK
PALO ALTO
ATHERTON
To San Jose
BAYSHORE
FREEWAY
U.S. 101
To San Francisco
To Dumbarton Bridge
San Francisco Bay
STANFORD UNIVERSITY BOUNDARY
INTERCHANGE
N

ANNEXE XV

Documentation sur San Jose University

SAN JOSE
STATE
UNIVERSITY

A campus of The California State University

School of Education • *Instructional Technology Department*
One Washington Square • San Jose, California 95192-0076 • 408/277-2631

COMPUTER COURSES, CURRENT, SCHOOL OF EDUCATION

INSTRUCTIONAL TECHNOLOGY

EDIT 122. Microcomputers in Education. Introduction to the microcomputer in education and training. Students will learn: (1) the major components of the microcomputer and their functions, (2) operating procedures, (3) selection, evaluation and utilization of hardware and software, and (4) will be introduced to the BASIC language and selected author languages. 3 units

EDIT 124. Evaluation of CAI Software. A survey of courseware available for use in computer assisted instruction in education and training; application of appropriate evaluation criteria to the selection of suitable materials. Specific content areas will be emphasized as appropriate by special course sections to permit specialization to meet interests and curricular needs. 3 units

EDIT 126. Microcomputer Wordprocessing for Teachers. Microcomputer wordprocessors. How to choose software and hardware. Practice with samples of major wordprocessing software and hardware. 3 units

EDIT 127. Authoring Microcomputer Programs. Authoring computer programs by modifying (authoring) selected commercial programs which are capable of being adapted to the needs, requirements, and learning level of a particular course of instruction. 3 units

EDIT 128. Instructional Microcomputer Graphics. Using the microcomputer to create, design, edit, store, and produce graphics for instructional and training applications in both multicolored paper and overhead transparency formats. Will include charts, graphs, and free form graphics. 3 units

EDIT 271. Computers and Education. Analysis of the role of the computer in individualizing instruction, evaluation, record keeping, gaming, and simulation in education. 3 units

EDIT 27 . Education Information Systems. Advanced studies in history, current development, and potential futures on information systems in education. 3 units

EDIT 27 . Instructional Interactive Video. Application of instructional design, video production, and computer theory to the production of instructional interactive video. Emphasis on production and examination of interactive video instruction as a training an educational medium. Prerequisites: EDIT 226 and EDIT 274 or equivalent. 3 units

IN PROCESS:

EDIT [illegible]. Computer classroom management utilization of data base, reporting, graphics, gradebook and word processing, using computer programs as tools in managing classroom records and o[illegible] 12 curriculum. Prerequisite: ED[illegible] 122.

Counselor Education

EDCO 296X. Microcomputers in Counseling and Guidance. 3 units

Special Education

EDSE 241. Microcomputers in Special Education Basic Skills Instruction. 3 units

EDSE 242. Microcomputers in Special Education Program Management. 3 units

March 1, 1984

A campus of The California State University

SAN JOSE
STATE
UNIVERSITY

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EDIT Computer Courses Approved for Extended Education. These courses have been designed especially as in-service courses to be taught in the field, or as short weekend courses.

EDIT 106. Microcomputers for the Non-Mathematician. An introduction to the microcomputer. Requires no knowledge of math. Learn how to use computer software and write simple programs using BASIC language. 1 unit

EDIT 107. Authoring Computer Software. Using selected educational software programs, learn how to modify a program with your own questions. (i.e., True-False, Multiple Choice, Matching). Includes use of remedial loop, reinforcement and score-keeping. Requires no previous knowledge of computer programming. 1 unit

EDIT 108. Constructing a Test for Use in a Microcomputer. Learner will acquire fundamentals necessary for constructing True-False, Multiple Choice and Matching type questions. 1 unit

EDIT 110. Pilot Introduction. Introduces PILOT, a computer language, for teachers who need to create materials for computer-assisted instruction. Students in the class will work with a variety of computers, including Apple II and Radio Shack. 1 unit

EDIT 122A. Microcomputers in Education. Introduction to the history, development and uses of microcomputers in instruction, training and research. Students learn the major components of the microcomputer and their functions, operating procedures, selection, evaluation and utilization of courseware, and BASIC programming. Students also become acquainted with selected authoring languages. 2 units

EDIT 122B. Microcomputers in Education. An advanced section of the course to provide students with the opportunity to apply skills and knowledge acquired in the introductory course (122A). Emphasis is on learning to apply criteria of evaluation and selection to the development of microcomputer facilities, laboratories, and instruction in the schools. 2 units

EDIT 123A. Microcomputer Word Processing. Using Applewriter II, the learner will be able to use the Apple computer as a word processor. Information (e.g., correspondence, outlines etc.) will be constructed, edited, stored on a diskette, retrieved and printed as hard copy 1 unit

EDIT 123B. Microcomputer Word Processing. Develop skills in utilizing the IBM Personal Computer for word processing. Produce, edit, stores, and modify documents, text, and correspondence. 1 unit

COMPUTER APPLICATIONS
Suggested Course Sequence

PREREQUISITES: (Select one) 3 Units, Required

EDIT 183 - Curriculum Materials and Technology, 3 Units
EDIT 186 - Using Instructional Media, 3 Units
EDIT 269 - Instructional Development and Media for College Teaching, 3 Units

M.A. Program: 30 Units

EDIT 200 - Instructional Technology: Professional Aspects, 3 Units
EDIT 122 - Microcomputers in Education, 3 Units
EDIT 124 - Evaluation of CAI Software, 3 Units
EDIT 126 - Microcomputer Wordprocessing for Teachers, 2 Units
EDIT 271 - Computers and Education, 3 Units
EDIT 272 - Educational Information Systems, 3 Units
EDIT 185 - Programming for Self-Instruction, 3 Units
EDIT 226 - Instructional Design Seminar, 3 Units
EDINT 221 - Research Seminar in Education, 3 Units
EDIT 270 - Instructional Technology Seminar, 3 Units

*Plus electives to complete 30-unit program.

PRACTICUM: 3 Units

EDIT 242 - Practicum in Instructional Technology, 3 Units

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*Suggested Electives:

EDIT 127 - Authoring Microcomputer Programs, 3 Units
EDIT 128 - Instructional Microcomputer Graphics, 3 Units
CYB 200 - The Technical Society, 3 Units
EDIT 274 - Instructional Videotape Recording, 3 Units
EDIT 276 - Futures Studies, 3 Units

Comments:

1. The M.A. program is 30 units.
2. Either EDIT 183, 186, or 269 is required as a basic prerequisite to all programs.
3. A practicum, EDIT 242, is required. Special adaptations may be made, but only by the advisor, EDIT 242 instructor, and student working together.
4. EDIT 183, 186, 269, and EDIT 242, Practicum, do not count as part of the 30-unit program.

DEPARTMENT OF INSTRUCTIONAL TECHNOLOGY • SCHOOL OF EDUCATION

SAN JOSE STATE UNIVERSITY, SAN JOSE, CALIF. 95192

9/83

IT Selected to Participate in IBM Model Program

Throughout the 1983-84 school year, 12 teacher training institutions and 89 public and private schools in California, Florida and New York will be part of the IBM Model Secondary School Computer Program. San Jose State University's Department of Instructional Technology (IT) was identified as one of four California teacher training institutes (networks). Each of the four networks will work with seven to nine secondary schools (network schools) to provide training and assistance. San Jose State University's network schools are: Bellarmine College Preparatory, William C. Overfelt High School, Pioneer High School, Santa Theresa High School, Gilroy High School, Institute of Computer Technology, and the California School for the Deaf in Fremont.

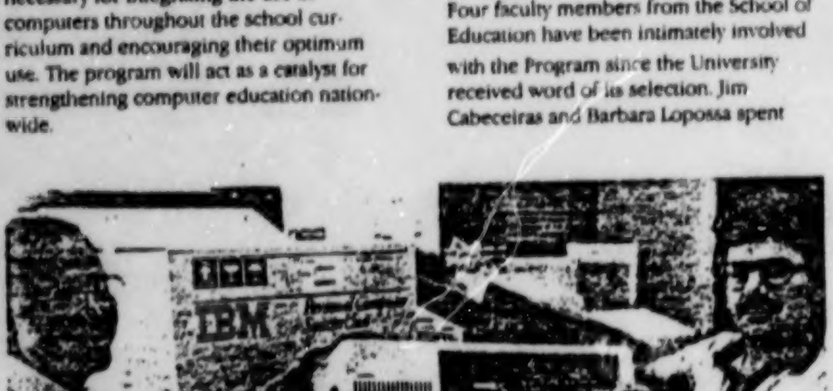
The IBM Model Secondary School Computer Education Program, an $8 million undertaking by IBM, is intended to provide secondary school faculty with the resources, assistance, and support necessary for integrating the use of computers throughout the school curriculum and encouraging their optimum use. The program will act as a catalyst for strengthening computer education nationwide.

Faculty from the network schools at work during the summer institute.

San Jose State University's Department of Instructional Technology was chosen to participate in the IBM endeavor because of its training program in the use of computers for instructional purposes. Four faculty members from the School of Education have been intimately involved with the Program since the University received word of its selection. Jim Cabeceiras and Barbara Lopossa spent two weeks in May at Educational Testing Services (ETS), Princeton, New Jersey for training. They, in turn, conducted summer training institutes for high school teachers and administrators from the network schools. Under the coordination of Harold Hailer, and with the support of ETS, Elaine Anderson and Jim Cabeceiras will continue to provide support to participating teachers as they implement computer education programs at their respective schools.

Fifteen IBM Personal Computers have been donated to the University and to each of its network schools by IBM. These schools have designed projects which incorporate computers into school programs specific to their needs. These projects include the training of parents who will in turn act as monitors allowing for use of the computers during after school and evening hours and the interfacing of computers with the Regional Occupational Program (ROP). The California School for the Deaf's computer education program will enhance students' program of study while simultaneously increasing their career alternatives.

The San Jose State University School of Education faculty is also acquiring hands-on experience through in-service workshops. These sessions aim at providing faculty with usable skills in spreadsheets, data base management, and word-processing.


Donated IBM Personal Computers being unpacked by IBM and SJSU staff members.